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July 31, 1930

Engineering News-Record

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Sewage Treatment in England and Germany

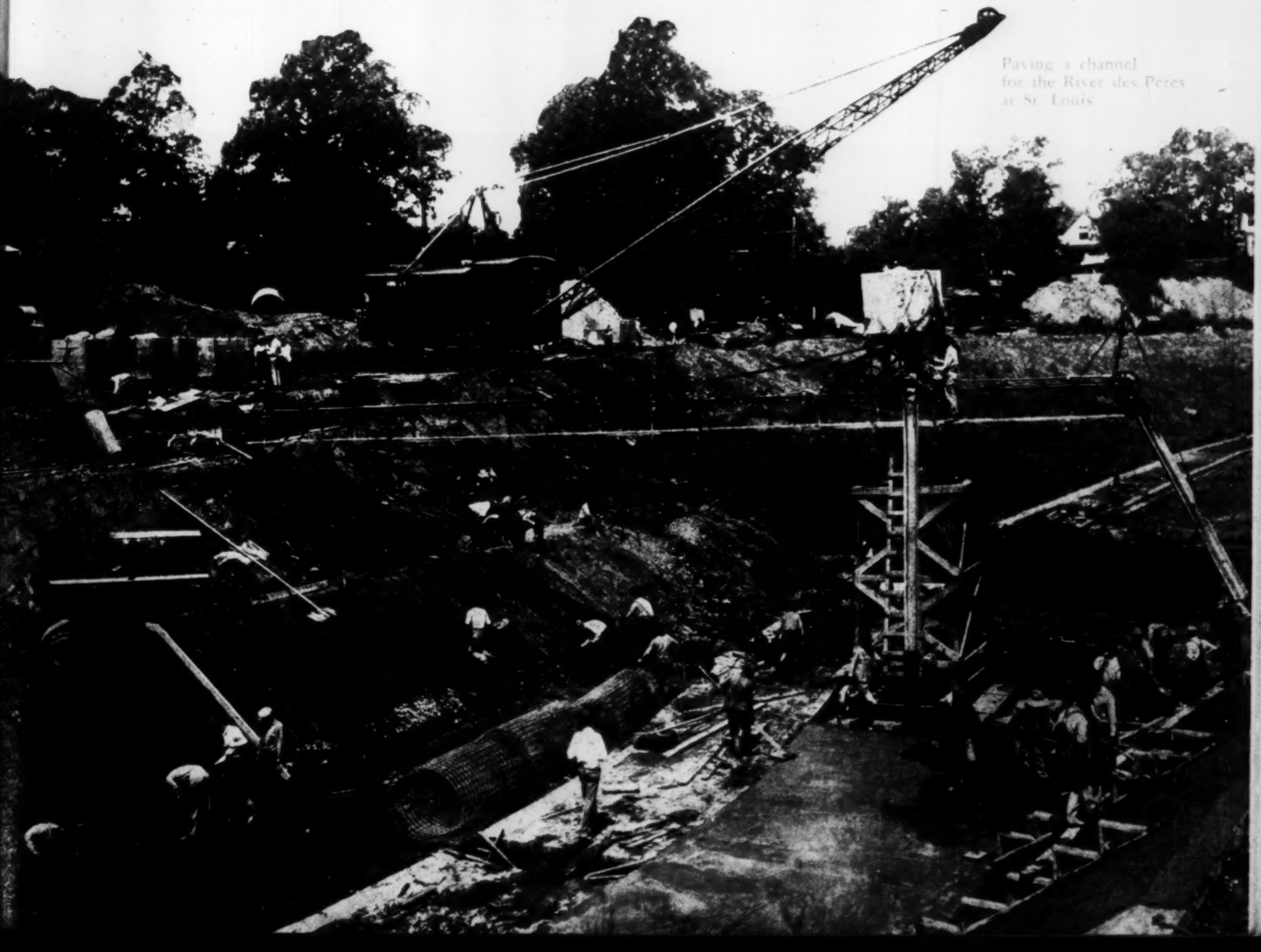
As Seen at 30 Plants by an American Engineer

Open Canal Work on the River des Peres Project

First Set-back Type Building in Boston

Seven New Mississippi River Bridges

Grading Douglas Fir Timbers for Structural Uses



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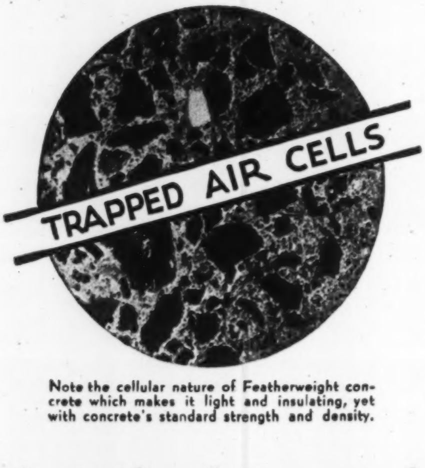

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The new Locust Summit District Central Breaker of The Philadelphia and Reading Coal and Iron Company has a capacity of 12,500 tons per day. The design of the building involved the support and bracing for over ninety pieces of reciprocating equipment used in cleaning and grading the coal.

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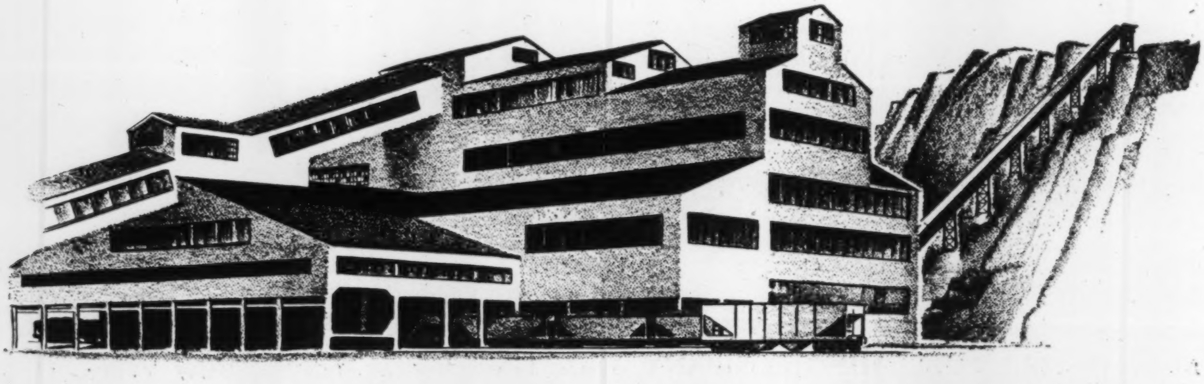

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DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

F. E. Schmitt, *Editor*

Volume 105 NEW YORK, JULY 31, 1930 Number 5

Allen Hazen

ALLEN HAZEN'S unexpected passing is a heavy loss to American engineering. His memorable achievements in water filtration, in advance of hydrologic knowledge, and in other fields give him a lasting place in the annals of civil engineering. Beyond this he stood as one of the highest exemplars of the engineer, alike in his attitude toward his art, his clients, and his professional colleagues. None knew him but to admire him and see in him a model to emulate. In the strength of his years he gave promise of contributing still more to human knowledge in his chosen field.

A Sign of Improvement

OCCASIONALLY a sign forecasting better days in public administration appears. The recall of Mayor Bowles by the city of Detroit was such a sign, of special meaning to engineers because it brought about the quick retirement of a commissioner of public works who entered office under unpromising conditions and almost at once proceeded to disrupt the service by dismissing the city engineer, Perry A. Fellows. The meaning of the public revolt evidenced in the recall result, which led Commissioner Gillespie to resign, was plain warning that the citizens insist on decent administrative policies in Detroit. The same insistence is needed in many cities, and we believe will in time come about. Ultimately it may reach into state government itself, sufficiently at least to assure reformation of the exploitation of highway building for political purposes.

Fire in Shaft Buildings

SHAFT and tunnel contractors, operating hoist and compressor machinery, will be interested in the account of the recent fire at the Ellison shaft of the Homestake mine, carried in our news pages this week. Although the shafthouse was constructed entirely of structural steel and corrugated iron, except for a wooden roof and a few wooden platforms, the fire generated heat intense enough to twist and warp heavy structural members. No definite origin of the fire can be ascertained, but if, as the local mine officials surmise, the air receiver was leaking, releasing an oil spray into the room, the fire serves as a further warning to contractors. It graphically illustrates that there is a definite fire hazard around shafts and compressors, a hazard that can be minimized only by absolute fireproof construction.

Sweeping Back the Tide

AS MRS. PARTINGTON'S sweeping the high tide from her kitchen with her broom was a doubtful success; so the workers for highway grade-crossing elimination find their efforts and successes offset by the continual construction of new crossings. Official reports of the Interstate Commerce Commission show that in the three years 1926-1928 no less than 5,853 grade crossings were added, against 3,849 crossings eliminated, making a net of 2,004 new crossings. A total of 240,089 grade crossings existed at the end of 1928, and we are adding nearly 700 new crossings each year. Certain it is that the situation is serious, although it also seems to have some elements of the ridiculous. While orating about the dangers of grade crossings, we are eliminating crossings with one hand and building them even more rapidly with the other. Under such circumstances neither public authorities nor railroads can be expected to show much enthusiasm in meeting the increasing demands for grade separation. It seems clear that if real progress is to be made, much closer consideration will have to be given by all parties concerned to proposals or plans for new crossings, to the conditions or requirements at each proposed crossing, and to the possibility of avoiding its construction without hampering necessary traffic facilities.

Earthquakes and Buildings

LAST Wednesday's great earthquake in southern Italy adds another major disaster to those which earthquakes have caused in recent times. With its death roll of thousands and the destruction of buildings that had stood undisturbed for generations or centuries, it gives new expression to the unpredictable occurrence and violence of earthquakes, feared from earliest times above all other visitations of nature. But at the same time it draws attention to the fact that while in the past man was powerless to set his strength against that of the earthquake, today he is in some measure able to do so. Knowledge and resources created within a very few decades make it possible to build with reasonable hope of weathering earthquake shock. Science has measured its effective force, and steel and reinforced-concrete construction provide means for resisting it. The future will no doubt see earthquake-resistant construction generally applied, if not to houses and minor structures, at least to our major public buildings and works for the service of communities. The earthquake in Italy will help in bringing this result about, and thus the world will gain through it just as it gained through the San Francisco and Tokyo disasters.

Highway Signs and Safety

INADEQUACY of direction signs on our highways is much more than an exasperating inconvenience—it is a serious danger. Road intersections are the site of a majority of highway accidents. We can only guess how many of these are indirectly caused by poor direction signs, but it is certain that the proportion is much larger than it should be. The attention of a motorist approaching a strange intersection is likely to be distracted from watching traffic to searching for some sort of sign showing his correct route. He may have to come to a full stop at the intersection while looking for a non-existent sign or trying to read an illegible one. Meanwhile others following him, impatient at the delay, pull around the stopped car into the face of traffic coming from three directions. Some signs, though substantial and legible, are placed beyond the intersections and face toward the roadway instead of toward oncoming traffic. This leads a driver to cross the intersection and then stop to read the sign, stalling the following traffic directly on the intersection. All these conditions represent obvious hazards. Adequate, substantial and legible direction signs properly placed are as necessary to highway safety as widened and superelevated curves, hard shoulders, warning signs and other features built into the road system for safety alone. Some states are showing excellent progress in providing these necessary direction signs, accompanied by approach signs placed some distance from the intersection. Other states are neglecting this work to a degree that is not in keeping with their general highway progress. Still other states show a wide variance of sign-marking efficiency within their own limits, indicating that the work is dependent on the aggressiveness of district engineers or patrolmen. No highway is safe until it is properly marked. The responsibility of providing the highways with suitable direction signs lies with the chief highway officials.

San Francisco Bay Bridge

THIS week San Franciscans are much nearer than ever before to a realization of their hopes for a bridge across the bay to Oakland. The harmonious deliberations and, apparently, the final agreement reached by members of a commission including federal and state officials have settled controversies as to location and have clarified the situation generally. Although public hearings are yet to be held and the report of the commission has not yet been written, the selection of a definite location, the rejection of routes whose impracticability has been demonstrated by the recent borings and the conclusion that tolls from the proposed structure will make a $72,000,000 project financially feasible—all these are progressive steps. The most hopeful sign of all is the prompt and businesslike action of the commission itself. President Hoover wisely appointed to this commission representatives of the army and navy, and although these officers cannot necessarily be looked upon as spokesmen for their departments, yet the fact that a decision was reached favoring a direct crossing via Goat Island has brought San Francisco more assurance of early consummation than has attended any prior bay bridge scheme.

Interstate Agreements

ARE interstate agreements on the disposition of natural resources in danger of being overdone? Such agreements seem to be increasingly popular, yet where well-established rights are involved they should rarely be necessary. Interstate waters are the chief subject of such agreements, usually because property and use rights in water still are imperfectly defined, but sometimes, as in the Colorado River compact, because political conditions are more influential than well-established rights. Each new court decision, however, makes water rights clearer and thereby reduces the necessity of interstate bargaining. Two important water cases now in litigation, one between Massachusetts and Connecticut for diversion of tributary flow of the Connecticut River in Massachusetts, the other between New Jersey and New York with Pennsylvania participating as an interested party, over diversion from streams in the upper Delaware River basin, ought to go far toward defining one of the basic elements of detention under riparian law—namely, the right of a downstream owner to unchanged and undisturbed flow of a stream, including the floodflow. The Delaware case is of special interest because an interstate agreement on the subject of contention has already been formulated, though ratified by only one of the three states so far. The issue of the suits mentioned will be highly constructive. Either it will establish the right of the lower owner to permanently undisturbed flow of stream, in which case many works in the river or utilization of river will be profoundly affected, or it will establish the right to impound and use all or part of floodflow. In either event, the need for special agreements will be reduced. Special agreements should not be invoked to define established rights, and where such rights exist it seems immoral to resort to treaty as a device for avoiding obstructionist litigation. The real service of such treaties is to adjust overlapping or incomplete rights or to provide for exchange of rights to the advantage of both parties. Here, and here alone, the interstate agreement has an important place.

Graded Structural Lumber

AMERICAN Lumber Standards, the well-known compendium of lumber grading rules, was adopted after authoritative conferences and has served effectively as a means of rating the quality of lumber. It is a dependable and representative piece of work. In the sense of structural grading, however, it is doubtful how effectively any single standard of strength rating applies to all species of lumber. Desirable as such a common standard would be, its development is beset by many obstacles. Species differ widely in grain and cell arrangement, rate of growth, moisture retention qualities, frequency and character of knots, checks and shakes, and in the structural grades these characteristics have a decided bearing on practical classification.

Structural grading in any one species is a much simpler matter, however, and the feasibility of accomplishing it has been demonstrated by producers of Southern pine. When a regional association of lumber producers, utilizing the knowledge of its foresters, technologists and practical lumbermen, agrees on a basis of rating and employs competent inspectors to classify and brand structural material at the mill, then it is to be expected that the construction industry can buy more effectively and may depend upon getting certain specified strengths. Classification of structural grades of Douglas fir and branding each piece at the mill was recently begun by a number of representative lumber mills in the Pacific Northwest in accord with grading rules issued last July by the West Coast Lumbermen's Association. This organization is representative of the Douglas fir industry and the new structural ratings were developed primarily for application to that species.

Lumber is not a homogeneous material; for structural uses it can be employed to best advantage when graded by an expert. Producers of Douglas fir are to be commended for developing structural grading rules and putting into effect the plan of branding at the mill. There remains the educational and promotional work necessary to familiarize builders with the branded grades and to make such material available wherever used. The real objective of the new grading rules will not be accomplished, of course, until the consumer, particularly in the construction industry, can and does buy grade-branded lumber from his local lumber yard.

As the situation now stands three important groups of producers have given attention to their respective structural grading problems—namely, Southern pine and Douglas fir, already mentioned, and more recently producers of redwood, who are particularly interested in bridge timbers and other long-life uses for large structural sizes. Ultimately, correlation if not actual combination of the separate structural lumber classifications may prove feasible. Meantime, whether with a view to immediate benefit or to achieving the ultimate ideal, the interests of both consumer and producer will be served to best advantage if in each type of wood the producers will make every effort to perfect and put into general use a practicable classification of their product for structural uses.

Air Control for Traffic

FOR several seasons automobile traffic in zones of congestion immediately surrounding stadiums in which football games are played has been directed from lookouts located on top of the stadium. The plan has worked well at the University of Illinois; it proved most useful at the end of the game, when cars leaving the inclosed parking areas create maximum congestion. Now comes control from the air, proposed as the best means for handling the 30,000 cars daily to and from the Curtiss-Wright-Reynolds airport northwest of Chicago during the national air races to be held Aug. 23 to Sept. 1. An airplane equipped with a radio sending outfit will cruise over the dozen or more routes to the field and will notify police headquarters at the airport of any undue congestion, accident or other source of delay to traffic at any point. This information will enable headquarters to order all traffic officers to divert or re-route traffic until the congestion is cleared. In this way all routes can be used to capacity.

In addition to this new control method a one-way traffic system is to be used for facilitating traffic. On many of the approach routes cars will travel three abreast in the same direction: toward the parking spaces at the airport in the morning and early part of the afternoon and away from the airport late in the day. Signs have already been erected at intersections near the airport indicating to through traffic that certain roads lead only to parking space. A "dress rehearsal" held over the Fourth of July supplied a test of the plan and was the basis for some modifications to secure a more even distribution of traffic, the main change being to bypass Evanston and other North Shore towns with their heavy through traffic and control lights.

Engineers and traffic officers of the county and adjacent towns have held many conferences to lay out feasible routes and devise the best means of handling the traffic. The work on the ground has been well done, being based on ample data of lane capacities and speed possibilities. Just how much the new air control will do in the way of further increasing traffic mobility remains to be seen, but the outlook is highly promising. Transportation movement is two-dimensional, and the introduction of an assisting device in the third dimension is almost certain to bring about a distinct gain.

A Significant Dry Period

STREAMFLOW reduction apparently greater in proportion than might be expected from the recent rainfall deficiencies in the Southeast is a feature of the current drought in that part of the country which merits close study. No accurate gagings are yet available. Most of the principal streams, however, get much of their flow from the areas of heavy precipitation in the mountains. Personal observations extending over most of this high country show that many streams already are near their minimum records. The immediate lack of rain, on the other hand, is not so great as during the great drought of 1925; hence the reasons for the absence of the usual relation between the rainfall and the streamflow in a great area remain to be determined.

Competent observers have advanced the opinion that this discrepancy is due to the fact that the groundwater reserves have never been fully restored since the 1925 drought. Certainly, the flow of certain important streams was less in 1926 than in the great dry year. Their 1927 flow also did not come up to the average annual total. The 1928 and 1929 totals exceeded the average in most cases in Virginia, the Carolinas and Georgia. But much of the annual rainfall of those years came in the shape of storms of great intensity. Consequently the runoff was quick and the infiltration probably less than usual.

Just how far these conclusions may be supported by accurate studies remains to be seen. It is unlikely that any such investigations will be made over an area great enough to permit definite findings. But the fact persists that streams are lower now than may be accounted for by the rainfall deficiencies of the last few months.

This low streamflow already has brought the pinch of rationed water supplies to many towns and cities in the Southeast. Prompted by the shortages resulting from the 1925 drought, some municipalities made extensive additions to their water resources. Few such communities have suffered yet from the present situation. Unfortunately, many urban centers concluded that the 1925 drought was a freak condition that probably would not again occur in a long period. All available records showed that such lack of precipitation had not been experienced previously. The oldest inhabitants knew of nothing of the sort. But the vagaries of the weather follow no fixed curve. Already, within five years, the Southeast is faced with a reduction in annual precipitation that may approach or even exceed the 1925 record.

Ample steam plant reserves and storage reservoirs have enabled the larger hydro systems to meet the present situation without difficulty. None of them apparently will be affected by further streamflow reduction that is likely to occur, but some of the smaller plants are not so fortunate.

Real relief from the deficiency of the great normal water resources of the Southeast will come only from a long period of steady rain. This will unquestionably occur in due course. Meantime, those communities and industries that have suffered from the lack of water due to these closely recurring droughts ought to take whatever steps are necessary to insure against a repetition of their experience. Such a situation may not have to be faced again in a long time, or it may be repeated again soon. There is enough element of fact in the apparent depletion of the groundwater resources of a vast territory to justify a thorough investigation. The results of such a study would help greatly in determining what facilities would have to be provided to avoid the recurrence of the present difficulties.

ISERLOHN SEWAGE-WORKS IN THE RUHR DISTRICT OF GERMANY

All operating power is by gas derived from sludge digestion. Plant consists of Imhoff, contact aerator, and activated-sludge tanks. Excess activated sludge is digested in the Imhoff tanks, producing gas which runs a gas engine. Power from latter operates the contact aerators, compresses air for the activation tanks and drives submerged paddle-wheels in these tanks. Sewage effluent used as cooling water for engines, after which water, with temperature raised, flows to sludge chambers of Imhoff tanks, increasing temperature about 4 deg. C. (7 deg. F.)

English and German Sewage Treatment—I

As Seen by an American Engineer

An Inspection of 30 Sewage-Works in England and Germany Indicates an Increasing Use of the Activated-Sludge Process, of Mechanical Devices, of Separate Sludge Digestion and of Gas Collection and Utilization

By C. E. Keefer

Engineer of Sewage Disposal, Bureau of Sewers, Baltimore, Md.

EUROPE continues to offer much of interest to the engineer who deals with sewage treatment. In spite of the World War, which greatly retarded the progress of sewage disposal both in Europe and in America, a marked advance has been made in England and Germany during the past few years. Vast sums of money are being spent to enlarge and remodel old works and build new ones. Large, modern plants have recently been completed or will shortly be in service in Leicester, Munich, Berlin and in the Essen and the Ruhr districts, as well as plants serving numerous other municipalities. The chief advances during the past few years in England have been in the activated-sludge process, while in Germany the digestion of sludge in separate tanks has been given much study. Germany leads the world in the collection and the utilization of gas from decomposing sludge.

The treatment of sewage in Europe is essentially the same as in America. European sewage is from two to four times stronger and therefore is harder to handle. Considerable industrial wastes make the treatment difficult and complicated. A striking illustration of this condition can be seen at Bradford, England, the center of the wool-combing industry. Large quantities of fat and organic matter are discharged into the sewage by wool-washing plants, and special provisions are required at the sewage-works to remove these objectionable materials. Local regulations affect the problem, as in England, where sewage, according to the Fifth Report of the Royal Commission on Sewage Disposal, should be settled from ten to fifteen hours and where the stormflow should be held in tanks with sufficient capacity to store one-quarter of the dry-weather flow.

It has been frequently stated that the European engineer is often more conservative than the American. If this is so, it will further explain some of the differences in sewage treatment in Europe and in this country. Many times the problem to be solved by a European city is not so much the building of a new plant, as is largely the case in America, as it is the enlarging and remodeling of an old one to provide for increased sewage flows and to have the plant conform to current treatment methods. Such a condition frequently introduces problems not encountered in the design of new works.

Screens—There is practically no difference between the coarse, hand-cleaned screens used here and abroad. The European, however, has perfected a great many different kinds and makes of mechanically cleaned coarse screens, some of which have been in successful operation for a number of years. In England the screens are usually similar to those made by Ham, Baker & Co., Ltd. The unit consists of parallel bars, placed at a slight angle with the vertical. Several rows of teeth, secured to endless chains, clean the bars and lift the screenings to an upper level, where they are disposed of. Examples of this type of screen can be seen at Reading, Leeds and Bolton. At Bradford wing screens, which consist of a series of bars radiating from a central shaft, are used. As the mechanism revolves, the screenings are caught and lifted clear of the sewage. When each set of bars comes into a horizontal position, a scraper, equipped with teeth, removes the screenings, which are deposited on a steel trough.

Several types of mechanically cleaned coarse bar screens are in use in Germany. At Hamburg can be seen Brunotte screens, which have been in service for a number of years. These units are made of a structural steel framework, over the front and back of which moves a group of members, provided with long narrow openings through which the sewage flows. Another type of coarse screen used in Germany is that made by Geiger. This consists of an inclined rack, which is cleaned by means of brushes, the lengths of which are about the same as the width of the screen. These brushes are secured to endless chains and are propelled along the bars. At the top of the rack is a smooth steel plate, over which the screenings are dragged, then allowed to fall into a receptacle for their final disposal. Geiger screens have been adopted at Leipzig, at Stuttgart and in the Ruhr district.

When a comparison is made between the number and variety of mechanically cleaned coarse screens in Europe and in this country, it is apparent that the American engineer has been slow to adopt this type of treatment. The number of manufacturers of mechanically cleaned coarse screens is far greater in Europe than in the United States, primarily because there has been little demand here for this equipment.

A somewhat different condition exists with regard to the use of mechanically cleaned fine screens. There are a number of installations of this kind in this country as well as in Europe. This type of treatment has been adopted to a much greater extent in Germany than in England. No plants in Europe were seen similar to that at Milwaukee, where the sewage passes through fine screens preliminary to its treatment by the activated-sludge process. A few of the unusual uses to which fine screens are put are at Bradford, to remove large quantities of sulphur bacteria from settled sewage prior to treatment by trickling filters, and at Essen-Rellinghausen, where a drum screen is employed for the screening of activated sludge.

OIL-RETENTION TANK AT ESSEN-RELLINGHAUSEN
Air is forced through porous plates set in the bottom of the skimming tank, causing the oil to float to the surface for removal.

Grit and Oil Chambers—The grit chambers observed in England and Germany differ little from those in this country. Mechanical appliances such as bucket elevators and overhead cranes are used for removing the deposited material. Dorr detritors are being used at the main sewage-works in Leipzig and also at the new Stahnsdorf plant in Berlin.

Small tanks for the removal of oil have been built by Imhoff at several plants in the Ruhr district. These tanks are rectangular units with inclined sides and with detention periods of about three minutes. Air, amounting to about 0.1 cu.ft. per cubic foot of sewage, is blown up through porous plates set in the bottom of the tanks. The oily material is forced to the surface, where it can be removed. A typical installation of this type has been constructed at Essen-Rellinghausen.

Settling Tanks—A wide variety of settling tanks is used in Europe. At Bolton, England, the old circular tanks with revolving scrapers of the Fidler type for pushing sludge to the central outlet are still in service. The general practice in England, however, is to remove the sludge from preliminary sedimentation tanks by hand. Rectangular basins with long detention periods are generally used. At Reading, where new settling units are nearing completion, and also at the new Leicester plant, the detention periods are about twelve hours. Tanks of this type are usually cleaned by squeegeeing, and several workmen are frequently employed to perform this operation.

One of the reasons given for the use of long detention periods in settling tanks in England is that the sewage there is much stronger than that in America, and by adopting large units the possibility of solids clogging trickling filters is lessened. On the other hand, the practice in Germany is to build settling tanks with much shorter detention periods of from two to three hours. The removal of the sludge from the sewage as rapidly as possible is the end desired. This result is satisfactorily accomplished in Imhoff tanks, of which there are a large number not only in the Ruhr and Essen districts but also in other parts of Germany. The Germans have also devised various mechanical means for removing sludge from settling tanks. Mieder at Leipzig has built four mechanically cleaned settling basins, each about 33 ft. wide and from about 160 to 200 ft. long. A traveling crane, which spans the tank and runs on rails along the longitudinal walls, is equipped with a long squeegee supported by four booms. Electric power is used to raise and to lower the squeegee and to propel the crane from one end of the tank to the other. The operation consists of lowering the squeegee until it rests on the tank bottom. The crane then slowly pushes the sludge to a sump, from which it is removed hydrostatically. The squeegee can also be raised until its lower edge dips a few inches into the sewage, in which position it can be used to skim the tanks.

At Essen-Nord, Prüss has built a circular settling basin, which is provided with revolving motor-driven scrapers for sludge removal. The mechanism is supported on a pier at the center of the tank and also on a continuous rail at the outer wall of the basin.

Practically no trusswork is used to support the squeegees or plows. Two large airtight steel cylinders, which are normally below the surface of the sewage, produce a buoyant effect and take the place of steel trusses.

At Karnap, a large plant in the Essen district, Prüss has also designed equipment for removing the sludge from four large settling tanks while they are in operation. A traveling crane, supported at the tank walls on tracks and also on pontoons, carries a sludge trough. Attached to this crane is a small floating barge, which can be moved crossways of the tanks. The barge is provided with a centrifugal pump which forces the sludge from the tank into the trough on the crane, and from there it flows to the point of disposal.

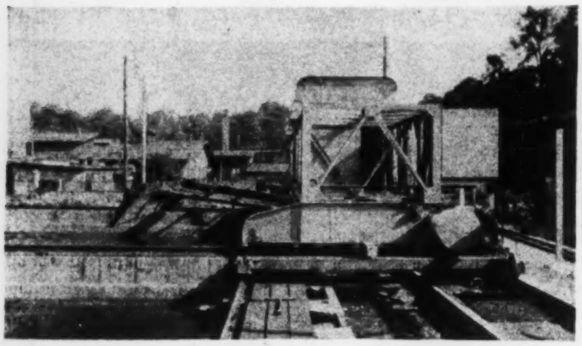
Settling tanks, equipped with Dorr clarifying mechanisms, are also being used. A small unit of this type has been in service for the last two or three years at Herbede, in the Ruhr district, and another unit is now being built at Witten. Dorr settling tanks are being constructed at the large plant at Stahnsdorf in Berlin. Still further means for the mechanical removal of sludge have been constructed by Imhoff, who has equipped the settling tanks at Werden with apparatus similar to that made in this country by the Link Belt Co.

As contrasted to English practice, the present tendency in Germany is to remove the sludge from settling tanks as rapidly as possible. The feeling is that the sewage is in a fresher condition, is more easily treated will produce less odor and presents fewer difficulties in further treatment.

In both England and Germany preliminary sedimentation is frequently used as an adjunct to activated-sludge treatment. This condition is the outcome of a natural course of events. As sewage flows have increased and higher standards of treatment have been required, many old sedimentation tank plants have not produced satisfactory effluents. The result is that supplementary treatment, consisting of the activated-sludge process, has often been installed.

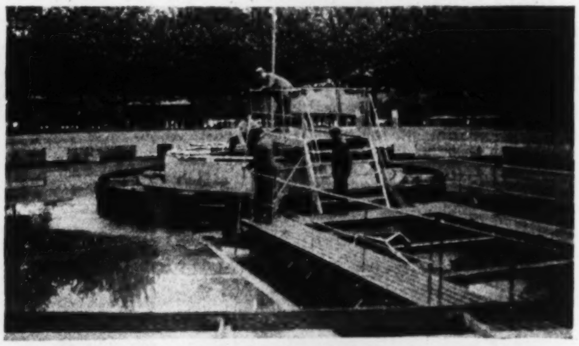
The sedimentation of activated sludge is usually accomplished in Dortmund tanks. This type of tank is generally satisfactory, although it was stated at some plants that sludge collected on the tank bottoms and produced scum and septic conditions. Generally speaking, the Dortmund tank seems to be satisfactory where the sewage flow is not great and a large number of units are not required. If European cities had to treat as large volumes of sewage as are produced by some of the large American municipalities it is possible that tanks of a different design would be used more extensively.

An interesting type of settling tank found in Germany but not seen in England or America is the underdrained settling basin. It is a large, shallow, rectangular tank with earthen bottoms and walls. Operation is in two periods. During the first period raw sewage flows through the unit until a considerable quantity of sludge has deposited. During the second period the sewage is diverted to another unit, the underdrains are opened and the basin then resembles a drying bed, where the accumulation of sludge is dewatered and eventually removed. The chief advantages of these basins is that their first cost is low and that they can later be used as sludge drying beds in case more elaborate and permanent settling units are installed.



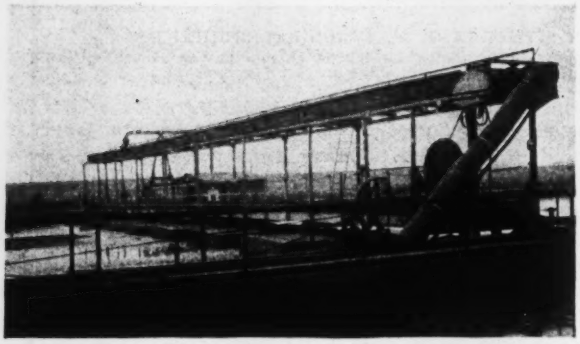
RECIPROCATING SQUEEGEE AT LEIPZIG

Electrically driven traveling bridge, spanning the tank and resting on the side walls, is equipped with a squeegee, which can be adjusted to skim the tank or remove settled sludge.



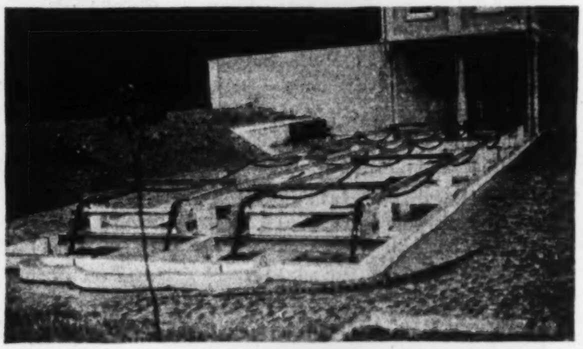
REVOLVING SQUEEGEE AT ESSEN-NORD

As the machine revolves under electric power, squeegees on the tank bottom move sludge to center of tank. Scum is forced into a trough fastened to one side of the machine.



BRIDGE WITH PUMPING EQUIPMENT, KARNAP

A bridge, on pontoons and traveling along the tank walls, supports an overhead trough, through which the sludge is pumped. A floating house contains the pumping equipment.



DRAG-CONVEYOR EQUIPMENT, WERDEN

Drag conveyors, attached to endless chains, are propelled along the tank bottoms and move the sludge to a pit at the inlet ends of the tanks, from which the sludge is pumped.

EQUIPMENT FOR REMOVING SLUDGE FROM SETTLING TANKS OF FOUR GERMAN SEWAGE-WORKS

Tanks operate uninterruptedly during periods of cleaning.

Trickling Filters—Trickling filters continue to be built in England and Germany, but their adoption is becoming less frequent due to the gradual perfecting of the activated-sludge process. There is no fundamental difference in the design and operation of trickling filters here and abroad. The English engineer, however, has devised many ingenious ways of applying sewage to filters. Frequently in the same plant three or four different kinds of mechanism can be seen. Chief among these is the horizontal revolving pipe, through which the sewage flows in fine streams on the filter stone. Such distributors are used at Bath, Bury, Birmingham, Leicester and many other places. There are also several different types of traveling distributors, consisting of a pipe or trough, which spans the filter bed and runs longitudinally on rails. Some of these are operated by hydraulic motors, which are propelled by the fall of sewage, while others are run by electric power. There is little difference in the kind of filtering material used here and abroad. An unusual installation can be seen at Bradford, where the filter material is coal, varying in size from about ½ to 1 in. In spite of the fineness of the material, it is claimed that the filters do not clog and that filter flies are not present. This condition is attributed to treating the sewage, preliminary to sedimentation, with sulphuric acid to coagulate the fats which are in the sewage.

Activated Sludge—Activated-sludge plants are being built to serve both large and small communities and to treat nearly everything from domestic sewage to sewage containing large percentages of industrial wastes. The process has been adopted not only to treat raw sewage but also to supplement sedimentation, as in the well-known case at Birmingham, where the sewage is settled and then activated before being applied to trickling filters. It is chiefly as an auxiliary method of treatment that the activated-sludge process is being adopted.

Two types of activation—air diffusion and mechanical agitation, the latter with three varieties—are used in England, each with its own adherents. The older type of activation, in which diffused air is blown through porous plates, set in the bottom of aerating tanks, perhaps predominates. Works of this kind have been constructed at Manchester, Worcester, Reading and Stoke-on-Trent. At Reading the aerating tanks are 22 ft. deep. It was felt that with such a depth the air bubbles could be in contact with the sewage for a considerable period of time, and consequently less air would be needed. Experience indicates that such is not the case.

Sheffield affords the outstanding example in England of mechanical agitation. In this method of treatment the mixture of sewage and activated-sludge flows through a series of long shallow channels, in which a number of paddlewheels force the sewage forward and contribute to the aerating process. One of the claims made by John Haworth, inventor of this system, is its low power consumption.

The plants at Birmingham and Stoke-on-Trent (Hanley works), England, furnish additional examples of aerating sewage by mechanical agitation. At Birmingham the sewage is aerated in long shallow channels which are 4 ft. 8 in. wide with a water depth of 4 ft. Inclined paddlewheels, set at the ends of the channels, keep the sewage in motion with a velocity of about 1 ft. per second. The aerated sewage flows to settling tanks and thence to trickling filters, where it is treated at twice the normal rate. Instead of using paddlewheels at Stoke-on-Trent (Hanley works), a somewhat different type of mechanism has been adopted. It consists of a revolving framework, to which are attached several cylindrical vessels with holes in their bottoms through which the sewage flows in a thin sheet as the vessels are lifted clear of the sewage. The revolving framework also imparts a forward motion to the sewage through the aerating channels.

Simplex aerators, developed by Joshua Bolton, have been installed at several small plants such as at Bury, Bolton and Epsom. One 30-hp. motor is sufficiently large at Bury to operate the aerating mechanism which treats the sewage from about 60,000 persons. The aerator consists of a revolving cone made of sheet metal, which is set at the surface of the sewage in the center of a comparatively deep tank, with a bottom in the shape of an inverted pyramid. Immediately below the cone hangs a hollow cylinder with its lower end open, reaching nearly to the bottom of the tank. As the cone revolves, sewage, mixed with activated sludge, circulates upward from the bottom of the tank through the cylinder and is thrown outward over the surface of the tank. New sewage surfaces are thus continually coming in contact with the atmosphere, which serves as a source of supply for oxygen. The claims made for Simplex aerators are economy of operation, low first cost and freedom from complicated mechanical equipment.

Imhoff has installed activated-sludge units in a number of sewage-works in the Ruhr district, Germany. This treatment is generally applied to settled sewage. Several of these plants contain submerged paddles located on the longitudinal axis of the aerating tanks. The paddles keep the sludge in suspension, and the air, which passes up through the sewage from a row of diffuser plates along one side of the tanks, is forced downward, and kept in contact with the sewage for a longer period of time than with air diffusion alone. It is said that when this mechanism is used less air is required. At the main sewage-works in Leipzig Mieder is also building additional treatment facilities, which consist of activated-sludge tanks provided with paddles.

For more than two years studies have been made at the Essen-Rellinghausen plant on the treating of sewage in several stages by the activated-sludge method. Three stages of aeration, each followed by sedimentation, have been tried. After the raw sewage has been aerated and then settled, it passes to the second stage of aeration and settling, and then to the third. The activated sludge, which collects in the third stage of the process, is returned to the sewage in the second aeration tank, and likewise the sludge from the second stage of aeration and sedimentation is discharged into the first aerating chamber. The sludge deposited in the first settling tank is discarded. The experiments have been sufficiently promising to warrant the construction of several medium-sized tanks for a further study of the process.

Contact Aerators—The successful use of contact aerators is being continued in the Ruhr district. Where an effluent better than that from a settling tank is required but where the high degree of treatment obtained by trickling filters or activation is not necessary, the use of contact aerators demands consideration. It is frequently possible to equip old Imhoff tanks with aerators at a small cost and thus produce a better effluent.

The second installment of this article, to be published next week, will deal with separate sludge-digestion treatment and the extensive use of byproduct gases in England and Germany.—EDITOR.

Calibration of Sixteen Triangular Weirs at Purdue University

By F. W. Greve

Professor of Hydraulic Engineering, Purdue University, Lafayette, Ind.

A STUDY of the flow of liquids through orifices and triangular weirs has been in progress for more than a year in the hydraulic laboratory branch of the Purdue Engineering Experiment Station. Water, oils and sugar solutions are being used to determine the effects of viscosity, density and surface tension upon the rate of discharge for given values of head. The work has been completed with respect to the flow of water, and in this article it is proposed to show the correlation of discharge to head for sixteen different triangular weirs with a range in central angle from 25 to 118 deg.

It should be borne in mind that calibration tests on a given instrument, machine or piece of apparatus are not strictly comparable unless the physical conditions surrounding the experiments are exactly similar. Failure to consider variation in plant set-up when combining data obtained from different investigations may lead to erroneous deductions. The control features, such as location of hook gages, material of weir plate, thickness of edge, and physical characteristics of the approach channel remained unchanged during the investigation herein described.

Apparatus—The notches were cut in soft steel plates, each of which was $\frac{1}{8}$ in. thick, 5 ft. long and 2 ft. wide. The openings were beveled on the downstream face at an angle of 60 deg. to the vertical plane to form a notch with an edge $\frac{1}{32}$ in. wide. The plates were coated with an asphalt paint and bolted to the upstream side of a wooden bulkhead, 4 ft. high, placed at the end of a long channel as shown in Fig. 1. Rubber gaskets were effective in preventing leakage at the bottom and sides of a weir. The water supply, created by a 6-in. centrifugal pump, entered the channel close to the bottom at a distance of 38 ft. upstream from the weir, passed through two series of baffles and over the weir into a movable trough, from which it could be diverted either into the reservoir or into a calibrated weighing tank of 20 tons capacity. The channel was of concrete, 6 ft. deep, 8 ft. wide at its upper end and 5 ft. wide in the lower portion.

Two hook gages reading to thousandths of a foot, were permanently aligned 13 in. in from one of the channel walls and at a distance of 5 ft. 3½ in. and 13 ft. 3½ in. respectively upstream from the weir. Two gages were installed not only to provide check values of the observed head but also to indicate any drop in pond level.

Method—The central angle of any particular notch was determined in two ways before a weir plate was installed in the channel. After direct measurements of an angle had been read on a protractor, the plate was placed on paper and eight different tracings were made of the notch for the purpose of computing the angle. The central angle, as recorded in Table I, was the average of the measured and calculated values. The weir was then placed in the channel, aligned vertically in a plane normal to the channel walls, fastened to the bulkhead with small bolts, and supported at the top and rear so as to preserve its true position.

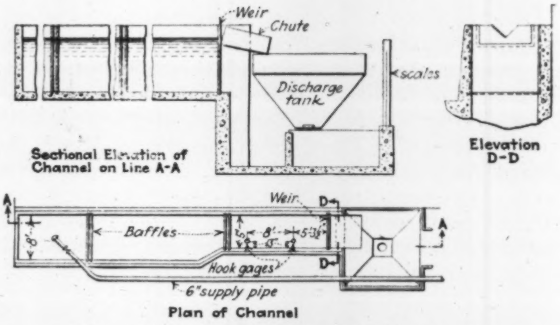
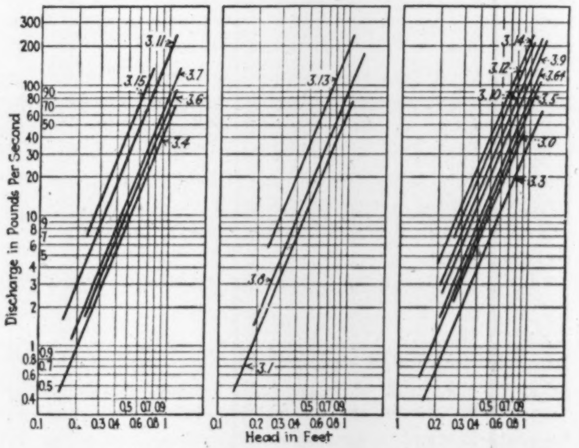


FIG. 1—DETAILS OF THE TANK AND WEIR

It will be noticed in Table I that weirs W-3.5 and W-3.6 have the same central angle, as do W-3.6A and W-3.7. Weir W-3.6 is W-3.5, which had been removed and then replaced without change in order to demonstrate that the set-up of a weir can be duplicated without affecting the relation of discharge to head. Upon completion of the experiment on W-3.6A, the type of baffles was changed, the weir was designated as W-3.7, and a second series of tests was run to determine the effect of this alteration in the channel of approach. It is evident that the results were unaffected by the particular type of baffle employed.

Zero-head readings on the hook gages were determined by means of a precise level and a finely graduated steel scale, the bottom edge of which was wedge shaped so as to make contact with the bottom of a notch. The level was set up in the channel from which the water had been drained and a number of readings were taken on the scale placed on the weir, after which the scale was transferred successively to the points of the hook gages. The gages were then adjusted until the reading on the scale coincided with that for the weir.

The flow into the channel was regulated by a valve near the outlet of the 6-in. supply line. Sufficient time, frequently as long as half an hour, was allowed to elapse before a test was started to permit the head to become constant. The number of tests for each weir ranged from 32 to 74, two tests being run for each condition of constant head. At least three readings of each hook gage were noted at equal time intervals for each test. Timing was done with a calibrated stop watch. The discharge was diverted through the movable chute into the weighing tank during a test and into the reservoir



FIGS. 2, 3 AND 4—RELATION OF HEAD TO DISCHARGE

Weirs 3.4, 3.6, 3.7, 3.11 and 3.15.

Weirs 3.1, 3.8 and 3.13.

Weirs 3.3, 3.0, 3.5, 3.6A, 3.9, 3.10, 3.12 and 3.14

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TABLE I—CHARACTERISTICS OF WEIRS

Weir	W-3.3	W-3.4	W-3.0	W-3.1	W-3.5	W-3.6	W-3.6A	W-3.7
Angle α	25° 03′	36° 53′	40° 00′	44° 24′	45° 23′	45° 23′	53° 55′	53° 55′
M	34.86	52.24	56.99	63.87	65.44	65.44	79.53	79.53
N	2.460	2.457	2.468	2.471	2.464	2.464	2.476	2.476
Weir	W-3.8	W-3.9	W-3.10	W-3.11	W-3.12	W-3.13	W-3.14	W-3.15
Angle α	59° 07′	69° 38′	81° 52′	94° 39′	98° 45′	102° 20′	110° 00′	118° 11′
M	88.65	108.6	135.3	169.1	181.7	193.6	222.4	260.0
N	2.478	2.460	2.469	2.474	2.479	2.466	2.468	2.469

between tests. This arrangement is shown in Fig. 1.

Results—The velocity of approach was negligible in all cases, its maximum value being 0.091 ft. per second with the largest weir in place. The corresponding velocity head was 0.000128 ft. There was no discernible drop in water level between the two hook gages.

Supplementary experiments on a 10-deg. triangular weir, the data for which are not included, showed excessive clinging of the water to the edge of the notch, and the results obtained were not in harmony with the relationships as herein described. It is quite possible that the equations developed cannot be applied to triangular weirs the central angle of which is less than 20 deg.

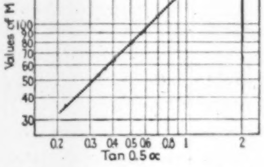


FIG. 5—RELATION OF M TO TAN $0.5a$

The variation in rate of discharge with head was plotted to a logarithmic scale as illustrated in Figs. 2, 3 and 4. Computed values for a given weir so nearly coincided in many cases that it was impossible to differentiate between them graphically, which explains why the number of tests exceeds the number of plotted values. It will also be observed that deviation of results for any test from the mean value is in most instances too small to be detected. The equations of all the graphs are of the form $q = M\ (h)^N$, where q is the discharge in pounds per second, h is the observed head in feet and M and N are constants for any particular weir. The exponent N is the slope of a graph with the horizontal plane and was computed in the following manner. First, the three centroids were calculated for each graph. Then the slope was determined for each pair of centroids and its average value recorded as N in Table I. It will be noticed that the value of N for any weir differs but little from the average value, 2.47. This difference should be charged to experimental errors and variation in the physical condition of the weirs. Triangular weirs are dynamically similar, hence N should be constant. Values of M, also listed in Table I, were computed for N equal to 2.47. That there is a constant relation between log M and log tan 0.5α, where α is the central angle, is clearly demonstrated in Fig. 5, which relationship can be expressed by the equation $M = B\ (\tan 0.5a)^C$.

Computations for B and C were made in the same manner as described for M and N, resulting in the equation $q = 156\ (\tan 0.5\alpha)^{0.996}\ (h)^{2.47}$. The rate of discharge in any unit other than pounds per second can be computed from this last equation by dividing 156 by the proper constant.

It is realized that only by the method of least squares can the exact values of B, C, M and N be fixed, but the centroidal method does produce results that are sufficiently accurate for engineering purposes.

It is expected that the results of a detailed study of weirs will be published as a bulletin of the Purdue University Engineering Experiment Station.

Construction Work in Volcanic Ash in San Salvador

By Roy C. Hardman
Construction Engineer, Monrovia, Calif.

THE behavior of certain volcanic formations is problematical, as was exemplified by the failure of the Alexander dam in Hawaii: This is no doubt due to the heterogenous nature of most volcanic soils when found in large quantities. The writer has worked for a number of years in volcanic countries and fully realizes the grave responsibilities of an engineer endeavoring to use such materials. Considerable experience has been gained over a period of three years in one form of volcanic soil known as ash or dust, and a short description of it and its action may be of interest.

The city of San Salvador, capital of the republic of El Salvador, is built upon a thick bed of volcanic ash or volcanic dust superimposed upon a bed of lava. The thickness of the ash varies from a few feet in the lower parts of the city, near the inclosing streams, to an unknown depth in the more elevated districts. At one point the ash was still encountered more than 60 ft. below the surface.

Nature of the Ash—The ash, of light gray color, has small pieces of pumice interspersed; the percentage of fines passing 200 mesh was 61.10; the specific gravity was about 2.35. Its appearance when perfectly dry is that of portland cement without the greenish tinge. The difference in fineness—61.1 as against 78 per cent for the cement—is not apparent to the eye. As the material was not used for any purpose, no laboratory study was made other than one for its suitability for use as fines in an asphalt mixture; it was found unsuitable.

As a material in which excavations must be made for underground structures such as sewers and storm sewers —streets often not more than 30 ft. wide between property lines, with rainfalls of from 3 to 5 in. per hour not uncommon—its appearance and analysis are far from prepossessing. Nevertheless it is an ideal material to handle and work. In its natural bed it is firmly compacted; it can be easily loosened by the hand and will stand vertically for years. Even at the end of the six months' dry season it is invariably moist a few inches below the surface.

Unsheeted Trenches and Tunnels—All excavations in the city were made without the use of shoring, sheeting or bracing, except in a few instances where a large storm sewer was forced against the property line, which is also the building line. Trenches as deep as 23 ft. were made in alternate open cut and tunnel without caving or sloughing. Nearly 5,000 ft. of 5x5-ft. tunnel was constructed without timbering of any sort, although at a depth of more than 60 ft.; the passage of trucks on the street overhead would shake down fine streams of ash from the roof. For climbing into and out of the excavations the workmen used steps cut in the walls.

Cut slopes on highway and railway work were made vertical and later cut down to ½ to 1 to overcome the overhanging appearance. The International Railways of Central America has one tunnel of some 3,000 ft. through this material, protected by masonry only at the portals. Other shorter tunnels are entirely unprotected.

Backfill Not Easily Compacted—When once excavated and loosened the ash is quite a different material and it is doubtful whether it can ever be compacted to anything approximating its original condition. In backfilling, tamping is of some value; water tamping practically worthless or worse. The most practicable means of consolidation is by traffic. When thrown out loose, even in thin piles or layers of a few inches, it is quickly compacted under foot traffic. Low dams so compacted were used successfully to divert stormwater from open excavations.

Its action when wet is peculiar. A heavy rainfall on a newly filled trench left the material in a quaky condition, which, although jelly-like, would support a 12-ton roller. The roller, however, had not the slightest effect other than creating a wave a few inches high preceding and following each wheel, much as would be the case in rolling sponge rubber. Water could not be brought to the surface by tamping. The only means of getting the backfill suitable for paving was by the lapse of time or another hard rain. Paradoxical as it may seem, the second rain left the trench in nearly perfect condition. Loose material in the path of running water acted as would be expected.

UNLINED RAILWAY TUNNEL IN VOLCANIC ASH
This tunnel has no protection whatever at the portals.

A Contractor's Experience—A paragraph from the final report of M. E. Gilmore, general manager for the contractors, R. W. Hebard & Co., Inc., and René Keilhauer, is quoted to show the action of the material during heavy rainfalls. "During the six months of rainy season many of the streets were often small raging torrents of water from house to house. With open trenches on these streets it was a serious question whether the foundations of houses would not be badly damaged or the houses collapse, which at times was imminent. Owing to the porous, friable volcanic formation and the cracked and fissured rock underlying, there was often witnessed the spectacle, during violent rainfall, of great streams of water pouring into open trenches and disappearing. It was absolutely terrifying. On two or three occasions holes were washed in the streets wide and deep enough completely to engulf a six-room house. [These occurrences were in streets not opened up. In one case the only visible opening from the street was a small hole in the cobbled pavement some 6 in. in diameter when discovered.] . . . And yet the job was completed without a single disastrous construction loss."

What became of the washed-out material in these cases was never discovered. It just disappeared underground. On one occasion water entered an open cut and left a tunnel some 50 yd. long down the center of a paved street, and large enough at the beginning to enable a man to walk erect; the material disappeared.

The material is excellent for highway fills, which compact quickly and well if built by wheelbarrow, which is the economical way where labor is cheap. As before stated cuts may be made vertical, which effects a great saving in yardage. Incidentally it has been the writer's experience that nearly any kind of soil will stand better at $\frac{1}{4}$ or $\frac{1}{2}$ to 1 than at the usual 1 to 1, in regions of torrential rainfalls and no frost. Other volcanic materials such as scoriae or volcanic cinders and disintegrated lava are no to be confused with the ash described.

Power Development at Springfield Requires Intake Changes

SEVERAL important changes are being made in the municipal water supply of Springfield, Mass., in order to make full utilization of the power possibilities of the Cobble Mountain dam. Water from the Cobble Mountain will flow through a power plant, built to meet peak loads, with a capacity approximately ten times the average flow, so that the entire daily discharge will pass through the plant in two or three hours. This large flow of water, after leaving the power plant, must be carried through a tunnel nearly a mile long for storage in existing reservoirs to maintain domestic water supply at a uniform rate. The tunnel itself, driven twenty years ago, is of sufficient capacity, but pipe connections originally provided at each end are sufficient only for water-works service and are inadequate to meet the new conditions. A contract for driving two additional rock tunnels, 840 and 730 ft. long, at Little River and at the filter plant in West Parish was recently awarded to the Dravo Contracting Co., of Pittsburgh. Detailed information is given more fully on p. 195 of this issue.

Part of the new work consists of installing two Venturi meters, one 6-in. and one 72-in., which will accurately measure the flow of water at all times. These meters are combined with two Dow gates with hydraulic control in such a way that the water will be automatically shifted to maintain accuracy of measurement. When the flow exceeds the quantity that will pass the 36-in. meter with a reasonable loss of head, one valve gate will open and the flow will be divided through both meters. When the flow falls to a point approaching that at which there would be failure to record accurately on both meters, the gate will close and all of the flow will pass through the smaller unit.

The second Dow gate is used as a throttling gate and is so connected as to back up pressure on either or both of the meters when the water is unusually low, and to prevent flow in excess of the capacity of the two meters. It will also close sufficiently to prevent loss of water over the spillway of the lower reservoir. Control of these units will be automatic, maintaining the conditions of water service without loss regardless of the discharge from the power plant.

The work is being done under the direction of E. E. Lochridge, chief engineer of the Springfield board of water commissioners. Hazen & Everett, New York City, are consulting engineers on the project.

Grading Douglas Fir Timbers for Structural Uses

New Grading Rules in Northwest Facilitate Close Rating and Promote Economy—Each Timber Has Grade Branded at Mill

By Chester Hogue

In Charge Technical Service Staff, West Coast Lumbermen's Association, Seattle, Wash.

DEFINITE progress has been made in the Pacific Northwest in the matter of rating the strength of timbers for more effective and economical use in structures. New grading rules of the West Coast Lumbermen's Association, which went into effect July 1 last, give a classified strength rating on structural timbers for specified uses, thereby providing a basis for selecting uniform material that can be used with maximum economy. To make the rules of practical value to the consumer and to place at his disposal expertly graded timbers of uniform quality, an increasing number of manufacturers are marking on each piece of timber at the mill the particular grade in which it has been rated. Grade-marked timbers of a specified grade are easier of identification, and the grade mark affords a quasi-guarantee of quality and responsibility.

The new structural grades are: (1) *superstructural*, (2) *structural* and (3) *common structural*. There are three use-classifications in each grade: joists and planks; beams and stringers; posts and square timbers. Although strength is the factor of primary importance in structural grading, several other considerations are recognized.

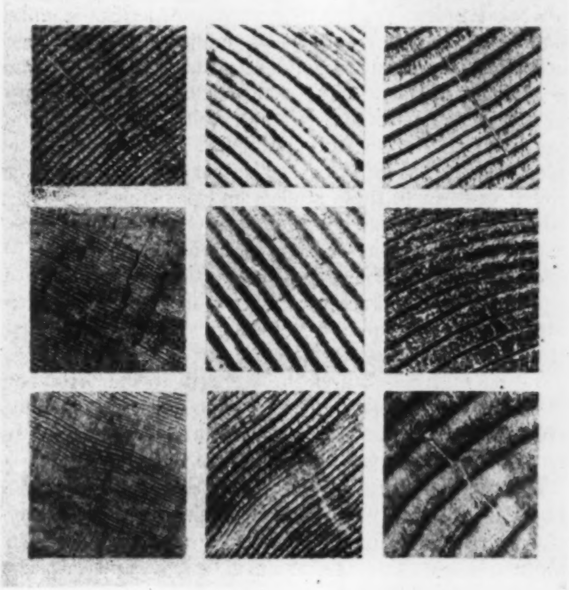
For many years working stresses for various species of timber were determined by breaking a number of pieces in a testing machine and applying a factor of safety to the average result to get a species working value. But as the strongest timber of a species may be more than twice as strong as the weakest timber, average species values gave high-grade material uneconomically low ratings and at times caused low-grade material to be used at unsafe values.

Late years have brought much study of the elements affecting strength. The breaking strength under various kinds of stress can now be foretold within a very few per cent, and grades of definite strength may be selected by visual inspection.

The basic strength, that of the clear wood, varies in proportion to specific gravity or dry weight, not only among species but also within a species. This weight is determined in some species by the relative amount of summerwood (the heavier, darker portion of the annual ring). Defects reduce the basic strength, the principal defects being size and position of knots; slope of the wood fiber with relation to the pith of the tree; and extent of shakes or checks. As a matter of fact, within a species strength depends more on defects than on specific gravity.

Knots—Knots in beams up to 6x12-in. size, or in posts up to 12x12-in. size, affect strength in almost direct proportion to their size with relation to the size of the piece. In the larger sizes the relative effect still would hold were it not that in the seasoning of a timber greater internal stresses are set up around a large knot than around one of smaller size. For this reason the permissible size of knots on the top or bottom face of a beam wider than 6 in., on the vertical faces of a beam wider than 12 in. and on all faces of a column wider than 12 in. is increased in proportion to the square root of the ratio of the wider face to 6 in. or to 12 in., as the case may be, instead of in direct proportion.

A knot-hole reduces strength probably even less than a sound intergrown knot. This is due to the fact that the fibers of a knot are at right angles to the general direction of fibers of the tree, and therefore contribute little strength. Furthermore, the lesser distortion of grain around a knot-hole than around a knot intergrown with fibers of the wood more than offsets what strength the knot would give.



CROSS-SECTION OF DOUGLAS FIR, SHOWING THREE TYPES

Structural types top and center rows. The two on lower left have too fine a grain (low in weight and strength requirements); those on the right have too coarse a grain and are too light.

Sloping Fiber—Increasing slope of fiber decreases beam strength in greater ratio than does the size of a knot. Slope of fiber is denoted by the direction of checks in seasoning of a timber. A slope of 1 in 40 in a beam is considered practically straight grain. Beyond this slope, in a beam, strength is decreased practically one-eighth by a slope of 1 in 20, one-fourth by a slope of 1 in 15, three-eighths by a slope of 1 in 11 and one-half by a slope of 1 in 8.

In posts the disadvantage of slope is not so great. Here slope limitations are really imposed more because of effect on checking and twisting than on strength. A slope of 1 in 20 is ignored; 1 in 15 is allowed seven-eighths strength, 1 in 6 one-half the strength of straight-grained wood.

Checks—A check is a lengthwise separation of the wood normal to the annual rings, while a shake is a lengthwise separation parallel to the curve of the annual rings. The effect of shakes or checks is principally on shearing strength in a beam or on ratio of length to least dimension in a post. As in the case of knots, the effect is almost directly proportional to extent, although a greater proportionate amount of shake or check can be allowed in a post than in a beam.

The foregoing comprises all of the factors which need consideration in determining the strength of a beam or post. Heartwood is a desirable factor in durability but not a necessary factor in strength, as no difference in strength is found between heartwood and sapwood of otherwise equivalent character.

The basic principles of structural grading have been set forth by the United States Forest Service, through the Forest Products Laboratory at Madison, Wis. These principles have been incorporated into basic provisions for structural grades in American Lumber Standards and have been studied and amplified in notes and comment in reports of the timber committees of the American Railway Engineering Association and the American Society for Testing Materials. American Lumber Standards give, as examples of application of the basic provisions, the requirements of grades having 75 and 60 per cent of the strength of green, clear wood. Working stresses for Douglas fir under all service conditions are given in the recently published structural grading rules of the West Coast Lumbermen's Association, which conform to these studies and principles.

Working Stresses—Determination of working stresses involves consideration of the inherent characteristics of a species, its durability and response to conditions of exposure and the factor of safety desired. Factor of safety alone is applied to elastic limit or ultimate strength, and depends on the element of time in loading. Duration of stress causes the strength to increase about 10 per cent for one-tenth the time—that is, a timber will carry 10 per cent more load for one year than for ten years with the same effect on the timber.

The Forest Products Laboratory has established stresses for three conditions of exposure during use—namely, (1) continuously dry, as in a building; (2) alternately wet and dry, as in a bridge; and (3) continuously wet. The basis for rating Douglas fir under these exposures is given in Table I.

TABLE I—STRESS RATINGS FOR DOUGLAS FIR

	Cross Bending	End Compression
	Lb. Per Sq.In.	
Continuously dry	2,000	1,467
Occasionally wet	1,733	1,333
Continuously wet	1,333	1,133

NOTE—These stresses are for unseasoned clear wood with slope of fiber not exceeding 1 in 40 in a piece in bending and 1 in 20 in a piece in compression, and free from shake or checks in a piece in bending, and with shake or checks not exceeding one-fifth of the width of face in a post.

From these values grade stresses are determined proportionately to the defects permitted. In pieces whose dimensions are 4 in. or less in thickness, the effect of defects in seasoning is not so great as in larger sizes, and (in continuously dry exposure) bending stresses 25 per cent greater than those given in Table I are allowed in clear wood, decreasing to the same stresses as in larger sizes in grades having one-half the strength of clear wood.

BOXED-HEART DOUGLAS FIR TIMBERS WITH CLOSE GRAIN

Timber having between six and twenty annual rings per inch is rated as "close grain."

Douglas fir density (specific gravity, or dry weight) is indicated visually by the proportion of dark summerwood in the annual ring. Working stresses may be increased one-sixth over the figures of Table I in material having one-third or more summerwood. In material of close grain—that is, having between six and twenty annual rings per inch—working stresses may be increased one-fifteenth. The greatest value of close-grain material, however, lies in the reduction of checking during seasoning because of the greater uniformity in the rate of growth and density and consequently the greater uniformity in shrinkage.

The extent to which timbers check in seasoning is a factor to be considered in stocking them, in remanufacturing, and particularly in rating their durability when exposed to the weather. Where deep checks occur, water can work deeply into a timber and decay may start before it dries out. Minimum checking and several small checks instead of a single large one are of decided advantage in timbers used in outdoor construction. Material of this desired quality, secured by selection for close grain, may have double or triple the useful life of a coarser-grained timber, and frequently will justify a higher price.

When boxed-heart timber is used, it is particularly desirable that close-grain be secured—that is, timber having not less than six annual rings per inch. Shrinkage on a flat-grained face is half again as much as on an edge-grained face, and in a boxed-heart piece (one containing the pith or heart center), there are four flat-grained faces pulling against one another, while in a side-cut piece two opposite pieces are of flat grain and two of edge grain, allowing each face to shrink with less strain.

In rating structural timbers under the use-classifications already given a distinction is made between joists and beams because of a difference in the method of measurement of knots and because of the increased stresses which may be used in joist sizes when in continuously dry service.

In beams and stringers the most commonly used grade is ***structural***. In this grade, defects are permitted which would decrease the strength to not less than 75 per cent of the stresses given in Table I. This really means an 80 per cent grade because of the requirement of close grain and the consequent increase of one-fifteenth in working stresses. The still higher grade, *superstructural*, comes up to a 90 per cent rating and is equivalent to dense structural, but selected for smaller defects in close-grained material. Dense superstructural has a value equal to that of clear wood not dense.

The *common structural* grade in the beams and stringers classification is a 70 per cent grade. In joist and plank it is a 60 per cent grade but has a value of 70 per cent when dense. In posts and timbers it is a 75 per cent grade. This is because Douglas fir does not have knots large enough to make it desirable to provide structural timbers of less value than those in larger sizes of material.

When continuously dry, the rating of dense superstructural is 100 per cent; of superstructural and dense structural 90 per cent; of structural 80 per cent; and of common structural 60 per cent. This is for joist and plank. When occasionally or usually wet, they become 86 per cent, 80 per cent, 70 per cent and 56 per cent grades.

In material of the joist and plank classification—a grade which can be used either on edge, as a joist, or flat, as a plank — stiffness is usually the governing factor in rating. Stiffness is practically independent of grade, so high stresses in bending usually are not required; consequently common structural, a 60 per cent grade, is the one most frequently employed.

In the post and square timber classification, just as in beams and stringers, structural (the 80 per cent grade) is the one most commonly used. For exceptional requirements a superstructural grade and a dense structural grade are available, and for less exacting requirements the common structural grade will serve.

FIG. 3—A STAND OF OLD-GROWTH DOUGLAS FIR TREES NEAR SEATTLE, WASH.

The five trees in the center group are about 6 ft. in diameter. Close to 80 ft. of clear trunk is shown of each. Trees grow thicker to the acre in the Douglas fir region than in any other part of the United States. One-fourth of all the standing timber in the United States is Douglas fir.

In the structural grade examples of American Lumber Standards, select structural is a 75 per cent grade (80 per cent in Douglas fir, because of the requirement of close grain), while common structural is a 60 per cent grade. In timber sizes Douglas fir does not run to defects of the size permitted in the common structural grade of American Lumber Standards; consequently the common structural grade of Douglas fir timbers is of somewhat higher value. The relation of working stresses in Douglas fir as rated under the new rules to those of the American Lumber Standards grades is shown in Table II.

Working stresses in Table II for beams and stringers continuously dry show ratings established for this use-classification and moisture condition. Similar tables for "occasionally wet" and "usually wet" are also available in this use-classification, as they are also in all three moisture-condition ratings on the other two use-classifications.

In timber for any use, heartwood requirements may be specified, and wane (scant corners) may be allowed or square edges may be required. Close grain or density may be specified in any grade in which they are desired but are not required in the rules of the Association.

TABLE II—BEAMS AND STRINGERS, CONTINUOUSLY DRY SERVICE

		Allowable Stresses, Lb. Per Sq.In.		
Grade	Rating by	Bending Stress	Shear	Compression Across Grain
Dense superstructural	W. C. L. A.	2,000	120	380
Superstructural	W. C. L. A.	1,800	105	345
Dense structural	W. C. L. A.	1,800	105	345
Dense select structural	A. L. S.	1,750	105	380
Structural	W. C. L. A.	1,600	90	345
Select structural	A. L. S.	1,600	90	345
Dense common structural	A. L. S.	1,400	84	380
Common structural	W. C. L. A.	1,400	84	325
Common structural	A. L. S.	1,200	72	325

TABLE III—A COST COMPARISON FOR TIMBERS OF EQUAL CARRYING CAPACITY

Common Structural		Select Structural	
Fiber stress 1,200 lb. per sq.in.		Fiber stress 1,600 lb. per sq.in.	
Amount required, 960 ft. of 8x12 (120 lin.ft.)		Amount required, 720 ft. of 6x12 (120 lin.ft.)	
Freight—960 ft., 3,168 lb. @ 72c	$22 81	Freight—720 ft., 2,376 lb. @ 72c	$17 11
Labor—Putting in place 960 ft. @ $15	14 40	Labor—Putting in place 720 ft. @ $15	10 80
Cost of freight and labor	$37 21	Cost of freight and labor	$27 91
Mill price 960 ft. @ $24	23 04	Mill price 720 ft. @ $34	24 48
Total cost in place	$60 25	Total cost in place	$52 39

The structural grading of timbers having made it possible to produce material of assured strength, it is often found by calculation that timbers of higher grade and higher strength will cost less in place than timbers of lower strength. In joists and rafters, where stiffness rather than strength is the governing factor, the higher grade is not economical, but in beams and girders carrying heavy loads the use of higher grades at higher stresses frequently permits the use of sizes so much smaller that the ultimate cost is less.

The grades of American Lumber Standards, for example, command bending stresses in Douglas fir one-third greater in select structural than in common structural. Because freight and the labor cost of placing timbers in a structure are no more per thousand feet for the higher grade than for the lower, the former may prove cheaper even at decided difference in mill price. An example illustrating this condition, as worked out by a leading West Coast producer of structural material, is shown in Table III.

Water Required for Concrete Paving Exclusive of Curing

A Meter Record of Daily Consumption for Sprinkling Subgrade, Mixing Concrete and Wetting Burlap

By E. A. Moritz
Consulting Engineer, Effingham, Ill.

The quantity of water consumed in a recent concrete-paving operation is given in various units in the accompanying table. This figure is important when water must be obtained from a small pond with intermittent inflow or from some metered source such as a city or railroad water system or from tank cars shipped in.

The work on which the tabulation was made was an Illinois concrete highway, Bates section, 18 ft. wide, 9-in. edge and 6-in. center. The subgrade was typical southern Illinois clay with practically no vegetable matter. The topography was slightly rolling. The paving outfit comprised a 27E paver supplied by industrial railroad haulage. Water was furnished through a 2-in. pipe with the pump located adjacent to the highway near the end of the job, the source of the water being a railroad water tank located about 1,000 ft. from the pump. The water was measured through a new 2-in. mushroom water meter which registered to a single cubic foot. The distance pumped varied from practically nothing to 5.2 miles. There was practically no visible leakage in the line; comparatively very little water was wasted.

Most of the concreting was done during August, 1929, with normal weather conditions for the climate and season. There were no unusual circumstances that would affect the quantity of water used either for concreting or sprinkling. The water was used for: (1) sprinkling the completed subgrade ahead of the paver; (2) mixing the concrete for the pavement; and (3) sprinkling the burlap covering on the completed pavement laid that day. Calcium chloride surface treatment was used for curing, so that no sprinkling of the finished pavement was required after the first day.

With the exception of the first few days the water meter was read daily, although not always at the same hour. The table gives the yardage of pavement laid and the quantity of water used each day for all operations. On Sept. 7 and 8 no pavement was laid, but a fill 900 ft. long was puddled for which 4,320 cu.ft. of water was used.

Column 7 of the table gives the gallons of water used per square yard of pavement. This is the only practical, although not entirely satisfactory, criterion on which judgment can be based as to the quantity of water required to supply a paving outfit. Examination of this column shows a wide variation in the unit consumption on different days. Small variations, or even considerable variations, would be expected on account of the nature of the operations, but such variations on two consecutive days as 15.6 gal. per square yard on Sept. 4 and 3.7 gal. per square yard on Sept. 5 were probably due to errors in the meter readings or because the meter was read on those two days at widely different hours. A similar explanation no doubt covers other discrepancies revealed by the figures in column 7.

Column 8 was added in an attempt to determine if there was any increase in water consumption as the distance from pump to paver increased, which could be explained by increased leakage from the supply line. No such definite indication was found, except after the first two weeks as indicated in column 9. Moreover, the last three weekly periods show a remarkable uniformity of consumption which is indicative of the accuracy and value of the information.

The water used on this project is probably very close to the minimum required, as care was taken to avoid waste and leakage and there was no condition at any time that would cause excessive consumption. The average consumption is 12.5 gal. per square yard of pavement. Where the curing process requires sprinkling or ponding for a period of ten days or more after the pavement is laid, the consumption must necessarily be much greater. Accurate information on this point would be equally valuable, but so far as the writer knows it is not available.

WATER USED ON CONCRETE-PAVING OPERATION, SHELBY COUNTY, ILL.

Water Obtained From B. & O. R. R. Tank and Measured Through a 2-In. Meter

1	2	3	4	5	6	7	8	9	10
Date	Pavement, Sq.Yd.	Pudding, Ft.	Meter Reading	Water Used, Cu.Ft.	Water Used, Gal.	Gal. Per Sq.Yd.	Distance from Pump, Miles	Average Consumption for Weekly Periods	Average Distance from Pump to Paver in Miles
1929	.....	...	13,819	.....	......	......	......	......	....
8/28	1,482	...	15,020	1,201	9,000	6.1	0.60	....	....
8/29	1,726	...	17,320	2,300	17,200	10.0	0.66	....	....
8/30	1,936	...	20,940	3,620	27,100	14.0	0.85	....	....
8/31	2,116	...	24,900	3,960	29,700	13.9	1.04	....	....
9/1	.....	...	......	.....	......	....	....	11.0	0.80
9/2	2,042	...	27,580	2,680	20,100	9.9	1.23	....	....
9/3	2,008	...	30,010	2,430	18,200	9.1	1.32	....	....
9/4	1,910	...	33,970	3,960	29,700	15.6	1.61	....	....
9/5	1,424	...	34,670	700	5,250	3.7	1.89	....	....
9/6	1,626		36,610	1,940	14,500	8.9	2.08	....	....
9/7	.....	900	38,270	1,660	12,400	....	....	9.4	1.65
9/8	.....		40,930	2,660	19,900	....	....	....	....
9/9	1,132	...	43,710	2,780	20,800	18.4	2.22	....	....
9/10	1,732	...	46,560	2,850	21,300	12.3	2.37	....	....
9/11	1,822	...	49,150	2,590	19,400	10.7	2.52	....	....
9/12	2,100	...	52,820	3,620	27,100	12.9	2.70	....	....
9/13	1,910	...	57,310	4,490	33,600	17.6	2.87	....	....
9/14	2,016	...	59,370	2,060	15,500	7.7	3.06	....	....
9/15	.....	...	......	.....	......	....	....	13.3	2.62
9/16	.....	...	......	.....	......	....	....	....	....
9/17	1,566	...	62,260	2,890	21,600	13.8	3.24	....	....
9/18	2,104	...	66,750	4,490	33,600	16.0	3.40	....	....
9/19	1,980	...	69,600	2,850	21,300	10.7	3.60		
9/20	1,206	...	72,270	2,670	20,000	16.6	3.77	....	....
9/21	2,106	...	74,970	2,700	20,200	9.6	3.94	....	....
9/22	.....	...	75,000	30	......	....	....	13.3	3.59
9/23	2,144	...	79,890	4,890	37,400	17.4	4.13	....	....
9/24	1,936	...	83,210	3,320	24,800	12.8	4.34	....	....
9/25	990	...	84,830	1,620	12,100	12.2	4.45	....	....
9/26	2,042	...	87,820	2,990	22,400	11.0	4.60	....	....
9/27	2,096	...	91,600	3,780	28,300	13.5	4.79	....	....
9/28	1,442	...	94,150	2,550	19,100	13.2	4.96	....	....
9/29	.....	...	......	.....	......	....	....	13.2	4.54
9/30	1,374	...	95,570	1,470	10,600	7.7	5.10	....	....
10/1	912	...	99,340	3,770	28,200	31.0	5.20	....	....

Total yardage, 48,880; total water, 85,521 cu.ft. (4,320 cu.ft. used for puddling) = 81,201 net = 609,000 gal. 609,000 gal. ÷ 48,880 sq.yd. = 12.5 gal. per square yard of concrete laid.

Revenues from California Forests Increase

Revenues totaling $1,647,360 were received from the eighteen national forests in the California region for the fiscal year just ended, which is an increase of $228,221 over the previous year and a gain of 123 per cent during the last decade. Timber sales provided $1,195,664, and grazing fees, recreational uses and water-power development made up the remainder. This land being nontaxable, existing laws require that 25 per cent of the revenues be returned to the state to be distributed to counties in which the forests are located for development of roads and schools. In addition the Forest Service spends 10 per cent of the receipts on roads and trails in the same counties.

Wind Design on First Setback-Type Building in Boston

Bents in Outside Walls and Elevator Shafts Designed to Carry 0.9 of Assumed Wind Pressure on 27-Story Building

By Scott W. Orr
Engineer, Parker, Thomas & Rice, Architects, Boston, Mass.

THE 27-story United Shoe Machinery Building in Boston represents a wide departure from other buildings in the city. Being the first of its type—that is, exceeding the old 150-ft. height limit and utilizing setback architecture—a short description of the methods used in designing the structure to resist horizontal forces may be interesting.

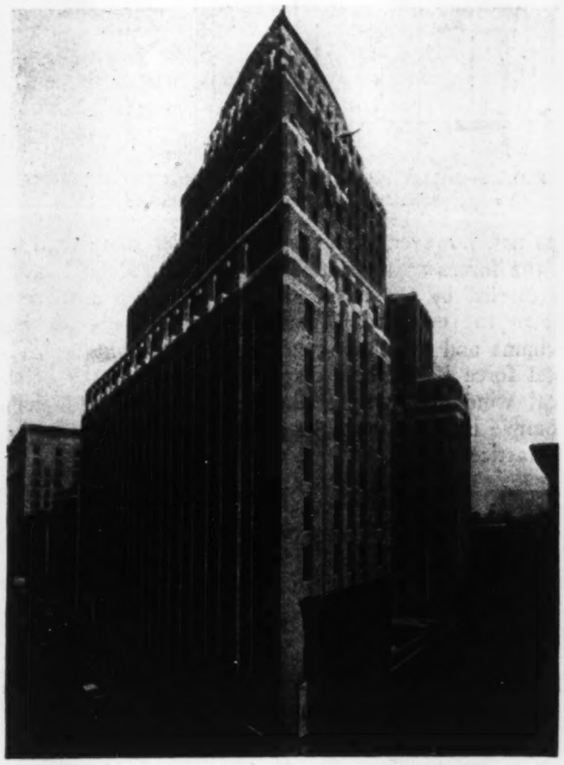


FIG. 1—THE UNITED SHOE MACHINERY COMPANY BUILDING IN BOSTON

First tall building erected under new ordinance permitting buildings more than 150 ft. high with setbacks.

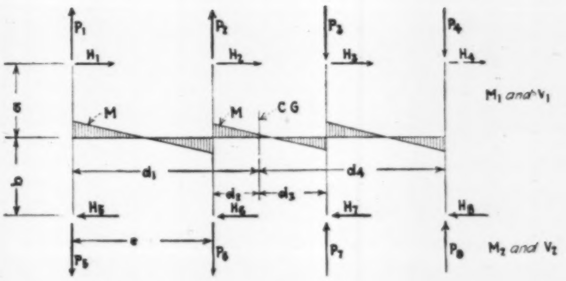


FIG. 2—MOMENTS AND SHEARS ON A BUILDING WIND BENT

M_1, M_2, V_1 and V_2 represent external moments and shears, while H_1, H_2, etc., represent shears at points of inflection.

A steel frame was selected as the proper support for a combination terra cotta and brick-faced building with concrete floor slabs. Spread footings of reinforced concrete were used, and an excellent substratum of clay and gravel allowed a maximum soil pressure of 6 tons per square foot. As the top of this building is approximately 300 ft. above the sidewalk, considerable attention was given to designing rigid connections between beams and columns. The city building code presented instructions for values of wind forces, which were religiously followed. These specified forces varied from 10 lb. per square foot in the lower stories to 20 lb. per square foot in the upper stories, to a height of 155 feet. From this level to the top, 30 lb. per square foot was the accepted value. Above the 21st floor it was assumed that the brick walls would offer sufficient resistance to the wind, since it was believed that only in the event of extraordinary wind would the masonry rupture, causing the load to be thrown into the steel frame. The necessity for rigid connections, however, was not minimized by this assumption because it was recognized that they have an important function to perform in reducing vibration from gusty winds and heavy street traffic.

A thorough investigation was made of many of the prevailing methods for computing stresses in a steel frame from wind forces. As accuracy was not considered adamant, a simple method, generally known as Fleming's No. 1 method, was selected and gave results reasonably close to the accurate method. The principal assumption made was that the point of inflection in a bent occurs at midspan for the beams and at the center of story height for the columns. Also it was assumed that the vertical forces in the columns varied directly with their distance from the center of gravity of the bent of which the columns formed a part. The shearing forces existing at points of inflection were obtained from these assumptions. Formulas were derived for

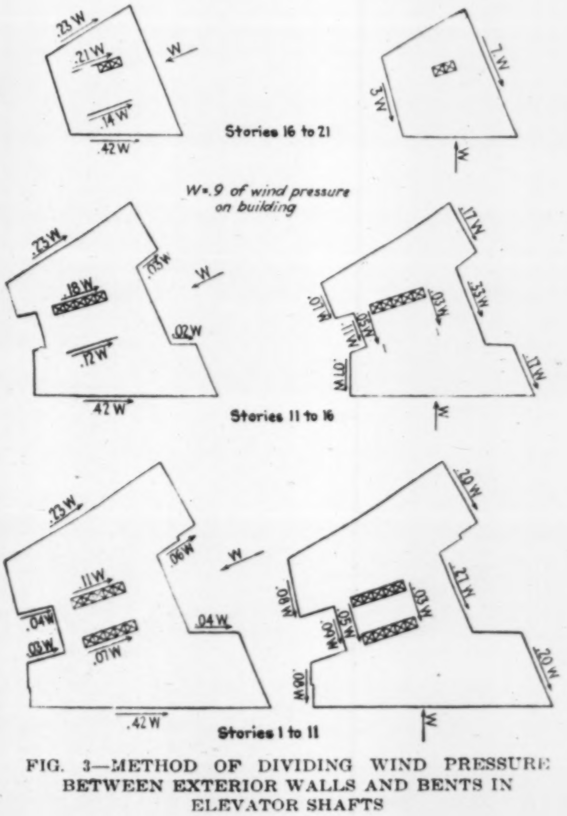


FIG. 3—METHOD OF DIVIDING WIND PRESSURE BETWEEN EXTERIOR WALLS AND BENTS IN ELEVATOR SHAFTS

shears to simplify the design computations, as follows:

Let M_1, M_2, V_1 and V_2 represent external moments and shears as shown in Fig. 2.

$$P_1 = \frac{M_1 d_1}{\Sigma d^2},\ P_2 = \frac{M_2 d_2}{\Sigma d^2},\ \text{etc.}$$

Exterior bay, P_5-P_1 = vertical shear through point of inflection at midspan of beam = W_1.

Interior bay, $(P_5 + P_6) - (P_1 + P_2)$ = vertical shear through point of inflection at midspan of beam = W_2.

$$\frac{Wl}{2} = M \text{ at end of beam}$$

Also, $aH_1 + bH_5$ = summation of moments at ends of beams = ΣM

Therefore, $$\frac{W_1 l}{2} = aH_1 + bH_5 \qquad (1)$$

But $\frac{H_1}{H_5} = \frac{V_1}{V_2}$, since the ratio of column shears is proportional to external shears.

Let $$\frac{V_1}{V_2} = R \text{ or } H_1 = RH_5$$

Substituting the value of H_1 in equation (1) above we have

$$\frac{W_1 l}{2} = M = aRH_5 + bH_5 = \Sigma M$$

or

$$H_5 = \frac{\Sigma M}{aR + b}$$

A preliminary design was made on the assumption that each individual bent across the building would resist the wind forces acting in a parallel direction. In the majority of cases, however, the continuous bent was divided into a series of separate bents by the interference of elevators, stairs and light wells. This naturally produced much larger stresses in the frame than when one continuous bent was available, and as the architectural requirements demanded shallow beams, expensive connections resulted, in some cases so expensive as to be impractical.

By assuming the floorslab as a horizontal beam, it was possible to transmit wind forces to exterior walls. It was not, however, necessary to consider more than 0.9 of the forces acting in this manner, as 0.1 could safely be carried by the interior bents. In Fig. 3 there is shown the estimated amount of wind loads on wall columns and on bracing around elevator shafts. The total force W in these diagrams is equal to 0.9 of the total wind acting upon the building. The following example indicates how the method was actually applied in practice:

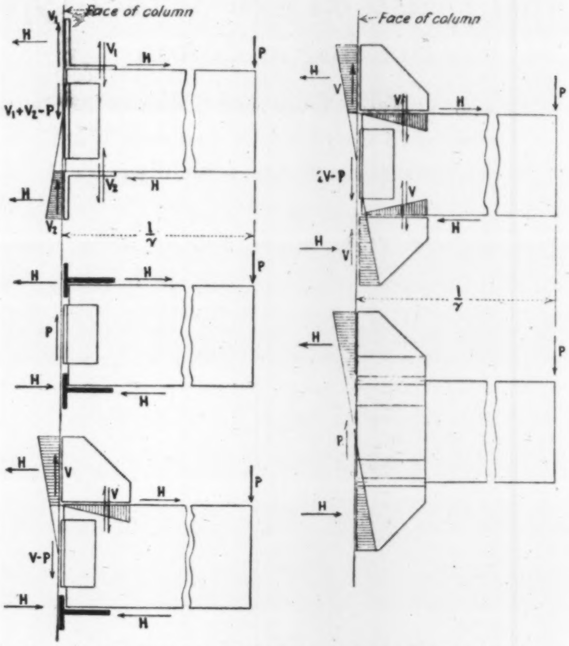


FIG. 5—BEAM TO COLUMN CONNECTIONS WITH ASSUMED ACTION OF STRESSES

Referring to Fig. 6 $\Sigma d^2 = 1{,}085$

$$P_1 = \frac{23.87}{1{,}085}\ M = \frac{M}{45.4} = \frac{309{,}000}{45.4} = 6{,}800$$

$$P_2 = \frac{6{,}800}{23.87} \times 5.04 = 1{,}440$$

$$P_3 = \frac{6{,}800}{23.87} \times 8.46 = 2{,}420$$

$$P_4 = \frac{6{,}800}{23.87} \times 20.46 = 8{,}240$$

P_5, P_6, P_7 and P_8 are derived by the same method, using M = 863,000

Moments at ends of beams are as follows:

End bay = (19,000 — 6,800) × 9.42 = 115,000 ft.-lb.

Middle bay (19,000—6,800 + 4,020 — 1,440) 6.75 = 99,800 ft.-lb.

End bay = (16,300 — 5,820) × 6.0 = 62,880 ft.-lb.

The ninth-story column shears are then obtained as follows:

$$R = \frac{41{,}200}{45{,}200} = 0.911$$

$$aR + b = 7.5 \times 0.911 + 5.42 = 12.25$$

$$H_5 = \frac{115{,}000}{12.25} = 9{,}380$$

$$H_6 = \frac{115{,}000 + 99{,}800}{12.25} = 17{,}520$$

$$H_7 = \frac{62{,}880 + 99{,}800}{12.25} = 13{,}290$$

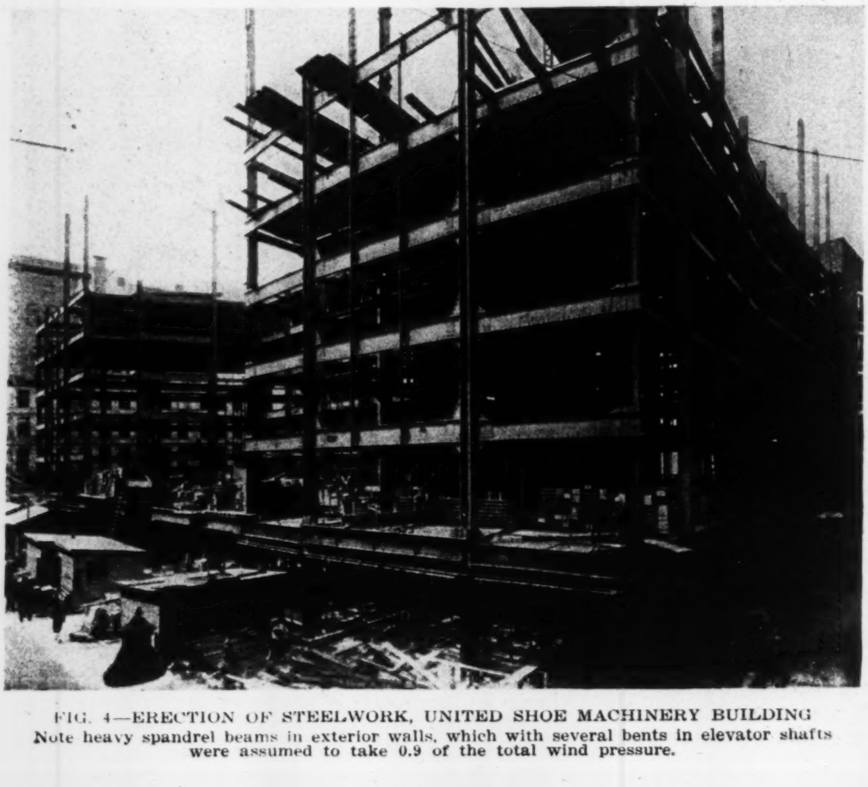


FIG. 4—ERECTION OF STEELWORK, UNITED SHOE MACHINERY BUILDING
Note heavy spandrel beams in exterior walls, which with several bents in elevator shafts were assumed to take 0.9 of the total wind pressure.

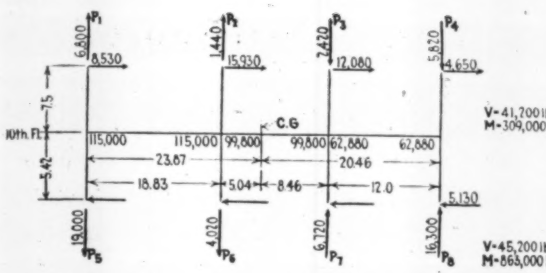


FIG. 6—A TYPICAL WIND BENT, UNITED SHOE MACHINERY BUILDING

$$H_8 = \frac{62.880}{12.25} = 5,130$$

$$\begin{aligned} H_1 &= 0.911 \times H_5 = 0.911 \times 9,380 = 8,530 \\ H_2 &= 0.911 \times H_6 = 0.911 \times 17,520 = 15,930 \\ H_3 &= 0.911 \times H_7 = 0.911 \times 13,290 = 12,080 \\ H_4 &= 0.911 \times H_8 = 0.911 \times 5,130 = 4,650 \end{aligned}$$

During the analysis of stresses in end connections of beams and girders transmitting moments and shears to columns, various assumptions were found applicable to the solution of each problem. To make an exact analysis involved the use of equations depending upon the elasticity of the material, a method which was prohibited both by time and by the uncertain initial stresses in rivets. The sketches in Fig. 5 demonstrate the assumed action of stresses in various types of connections.

Reclamation Problems Analyzed in Economic Study

Active State Co-operation in Construction and Maintenance Urged—Government Credit for Individual Settlers Needed

A SPECIAL study of Western irrigation projects, both federal and private, was carried out last year by a board of experts appointed by the President, with a view to restudying the existing reclamation policy of the federal government and outlining changes that might be found desirable. The report of this special board, published by the U. S. Bureau of Reclamation, contains two recommendations of particular importance: first, participation by the states in the financial and other responsibilities of construction, settlement, operation and maintenance of irrigation projects; and second, provision of credit to take care of the needs of settlers in the early years of each project, during the transition from raw land into producing farms.

In preparing the report, investigations were confined to 22 projects, both federal and private, which have experienced difficulties. No attempt was made to study the 84 per cent of lands which have turned out satisfactorily. Specific recommendations were made in each case, considered, and, in addition, the knowledge thus obtained was utilized in drawing up broad recommendations for modification of the present reclamation policy of the government.

The board holds that it is by no means established that project lands should pay the entire cost of construction, even on an interest-free basis. In justification of this attitude the report states that conservation and utilization of water resources in the arid section of the country is fully as important to state development as, for example, the control of floods or the maintenance of navigation in other localities. A general rule, applicable throughout progressive parts of the world, is stated to the effect that every agricultural community maintains an equally populous non-agricultural community, and every unit of agricultural capital leads to the formation of non-agricultural capital twice its own magnitude. Therefore it is held that the welfare of the entire community is benefited by reclamation development, justifying greater expenditures than can be amortized directly by the land concerned. Excess funds necessary should logically be provided by both federal and state governments. A second argument advanced by the board for state participation is that, under the present system of federal control and financing, there is a tendency for each state to ask for the development of lands which are not economically suited to reclamation. Such development brings unsatisfactory results and discredits the entire reclamation policy. State participation in each project would, according to the report, check this development of low-grade land.

Credit for Settlers

From its study of the problems of farm development in irrigation projects the board concluded that settlers require aid by financial credit in the early years of low return and high expenditure. In this it supports recommendations made by a number of students of the subject during recent years, among them Dr. Elwood Mead, commissioner of reclamation.

The report places the minimum capital requirement of each settler at $5,000, which must be expended before his tract becomes self-supporting. Few settlers can command this amount, it states, and therefore credit must be provided to make up the deficiency. Because governmental charges for construction payments and water rentals act as prior liens on the land, private agencies exact high interest rates for such loans as they are willing to make, and refuse loans entirely except under very favorable conditions. Manifestly, it is to the best interests of the federal government, the state and the settlers themselves to secure full development at as early a date as possible, and for this reason the board recommends the establishment of a reclamation credit institute, which would grant loans under suitable precautions from funds provided jointly by the state, federal government and the project itself. These loans would be safeguarded by requiring that the money be expended upon actual improvements to the land.

Other recommendations made by the board advise the sale of temporarily or permanently unproductive lands under a system of deferred charges; the assessment of construction charges in proportion to the value of the land affected, rather than at flat rates; precautions to prevent land speculation in irrigated areas; and the provision of expert technical advice to promote efficient utilization of the land.

Members of the board which prepared the report are as follows: the late George C. Kreutzer, director of reclamation economics until his death, chairman; Dr. Alvin Johnson, associate editor, Encyclopedia of Social Sciences; Dr. Charles A. Lory, president, Colorado Agricultural College; Dean Anson Marston, school of engineering, Iowa State College; Prof. Frank Adams, college of agriculture, University of California; A. C. Cooley, senior agriculturist, U. S. Department of Agriculture; John W. Haw, director of agricultural development, Northern Pacific Railway; and Hugh A. Brown, assistant director of reclamation economics, secretary.

Constructing River des Peres Drainage Canal in Earth—II

New St. Louis Sanitary and Floodwater Canal, Crossing and Recrossing Sinuous Channel of River des Peres, Called for Extensive Diversion and Drainage to Dry the Ground for Placing Canal Lining and Constructing Under-Canal Sewer

By W. W. Horner
Chief Engineer, Sewers and Paving, St. Louis, Mo.

The Location of the River des Peres drainage channel, as described in the article on engineering plan and design (*Engineering News-Record*, July 24, 1930, p. 124) made it obvious that drainage would be the controlling factor in the problem of constructing the new channel.

The logical procedure was to begin at the lower end (Fig. 1) and proceed upstream so that the completed channel would take away the water from the work in progress. In general this plan was adhered to, but there were evident modifications practicable for expediting the work. The 6-mile section from Lindenwood to the Mississippi River was straightforward excavation of flood channel that could be carried on independently of other operations. Also time was needed to secure the right-of-way. Finally, there was the completed intercepting sewer to handle drainage from work upstream from Lindenwood. These conditions made it evident that speed would be gained by commencing work on the middle division open canal north of Lindenwood, and this plan was adopted.

This middle division was 15,900 ft. long and was divided into contract sections A, B, and C, as shown by the project plan, Fig. 1. In awarding the work, section B was again divided into subsections B1 and B2. Broadly speaking, sections A and B1 were trapezoidal channel in earth and sections B2 and C were various combinations of rectangular and trapezoidal channel in rock with earth overburden. In describing the construction procedure, clearness is gained by considering the two types of channel separately. This article describes the open canal in earth.
—Editor.

FIG. 2—DRY-WEATHER FLOW DIVERTED THROUGH CORRUGATED-IRON FLUME

As POINTED OUT in the preceding article on general plan and design, construction involved floodways whose bottom or flow line would lie considerably below the bed of the natural stream. At Lindenwood the flow line of the new channel was about 9 ft. lower than the natural streambed, and as the work progressed upstream the difference in elevation increased. Therefore, while there was available at Lindenwood a low-level sewer capable of carrying away the dry-weather flow and of draining the works during dry weather, nevertheless floods coming down the valley in and along the newly constructed channels would have to be stepped up 9 ft. at the lower end of the work, so that a stilling basin would be formed in which the silt of the stream would be deposited. Second, the lowering of the streambed would incidentally lower the groundwater table throughout the whole valley, and the outseeping of groundwater would temporarily render the banks of the channel unstable.

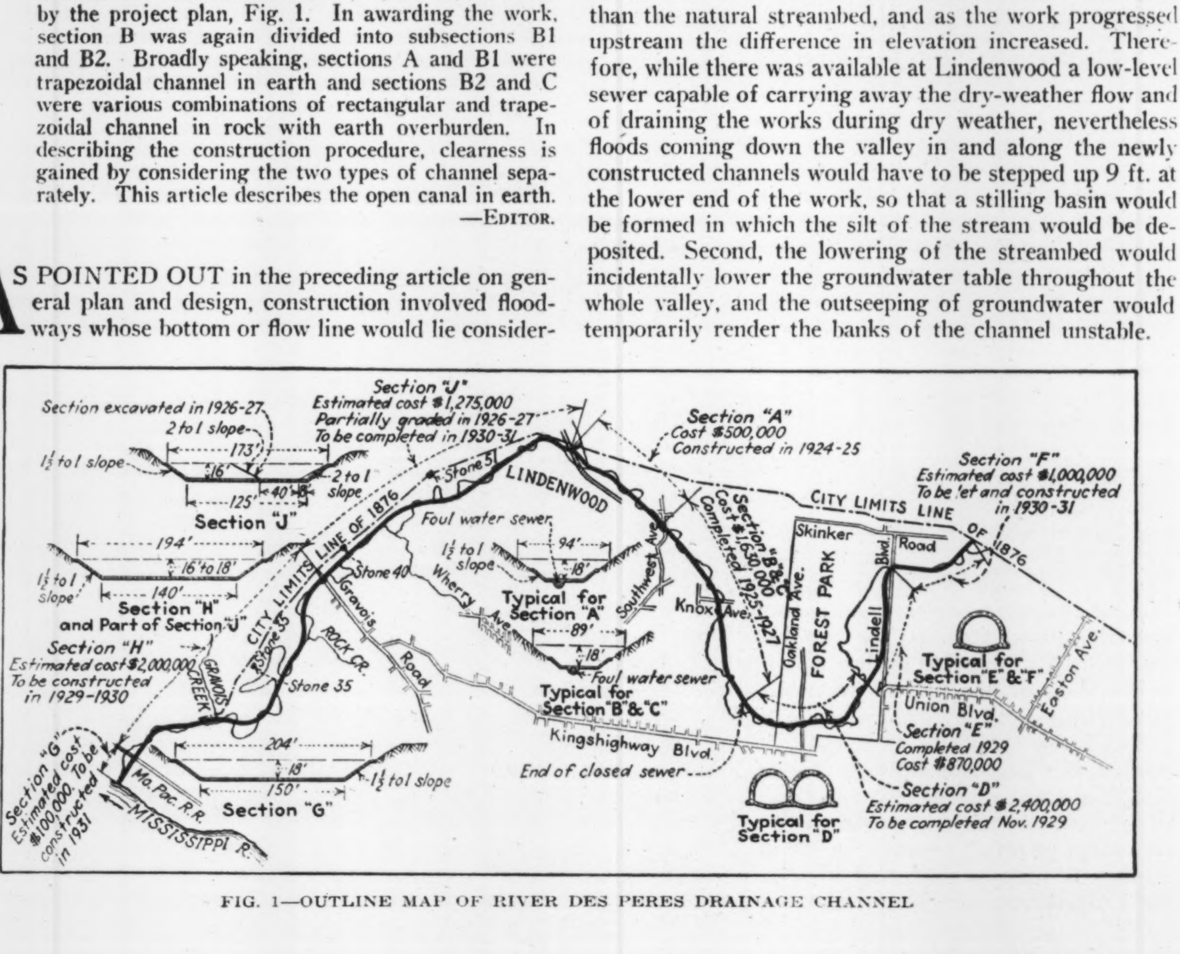

Section excavated in 1926-27
2 to 1 slope
1½ to 1 slope
173'
16'
2 to 1 slope
125'
40'
8'
Section "J"
Section "J"
Estimated cost $1,275,000
Partially graded in 1926-27
To be completed in 1930-31
Stone 51
LINDENWOOD
Section "A"
Cost $500,000
Constructed in 1924-25
Section "F"
Estimated cost $1,000,000
To be let and constructed in 1930-31
CITY LIMITS LINE OF 1876
194'
16' to 18'
1½ to 1 slope
140'
Section "H" and Part of Section "J"
Section "H"
Estimated cost $2,000,000
To be constructed in 1929-1930
CITY LIMITS LINE OF 1876
Stone 40
Stone 35
Stone 35
Gravois Road
ROCK CR.
GRAVOIS CREEK
Foul water sewer
1½ to 1 slope
94'
18'
Typical for Section "A"
Wherry Ave.
Southwest Ave.
89'
18'
Foul water sewer
Typical for Section "B" & "C"
Section "B" & "C"
Cost $1,630,000
Completed 1925-1927
Knox Ave.
Oakland Ave.
FOREST PARK
Skinker Blvd.
Road
Lindell
Typical for Section "E" & "F"
Union Blvd.
Easton Ave.
Section "E"
Completed 1929
Cost $870,000
Section "D"
Estimated cost $2,400,000
To be completed Nov. 1929
Typical for Section "D"
Kingshighway Blvd.
End of closed sewer
Section "G"
Estimated cost $100,000. To be constructed in 1931
204'
18'
150'
1½ to 1 slope
Section "G"
Mo. Pac. R.R.
MISSISSIPPI R.

FIG. 1—OUTLINE MAP OF RIVER DES PERES DRAINAGE CHANNEL

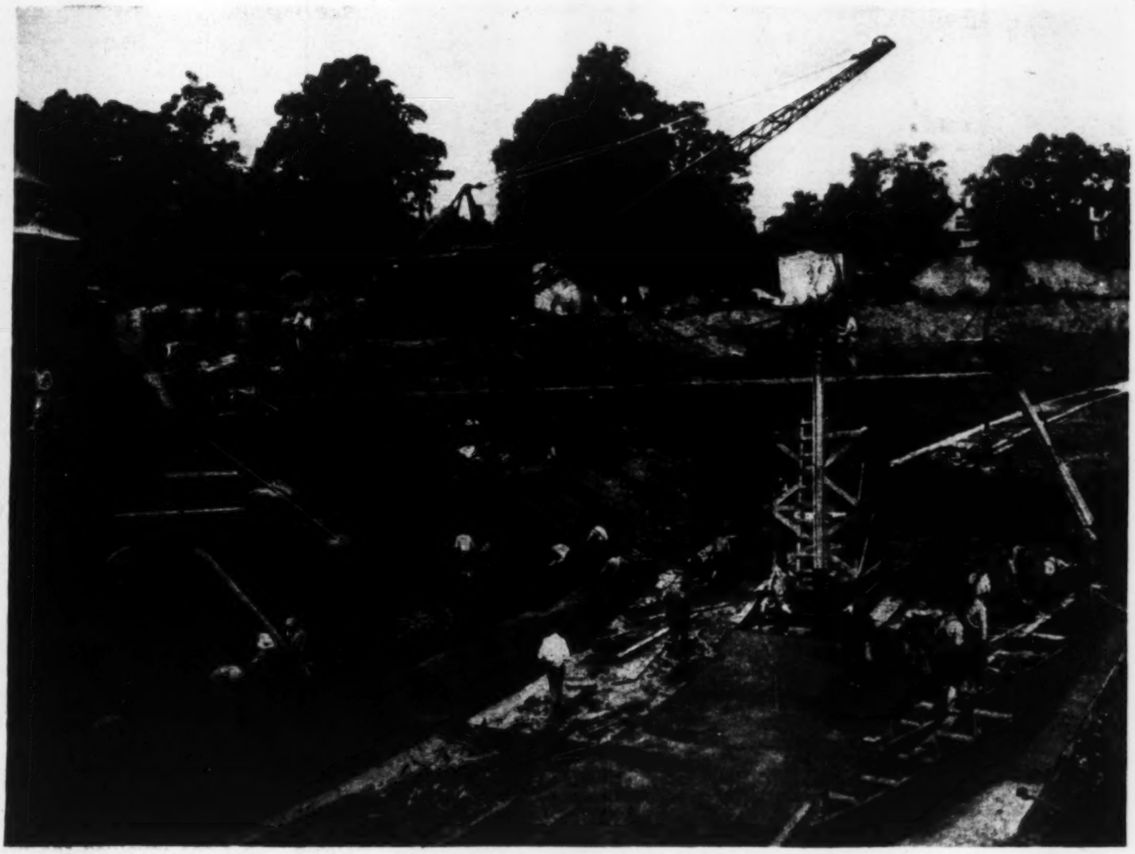


FIG. 3—CONSTRUCTION OF THE LINING ON SECTION A

The slab over the completed sanitary sewer in the center of the picture both in and ahead of the section being lined. Trimming of the banks is proceeding with the small dragline in the background. The device for placing the concrete consists of a light truss carrying a belt conveyor. One end of the truss is supported on a track at the top of the bank and the other on a movable tower. Concrete from the mixer is discharged direct into the small hopper at the shore end of the truss. By means of a traveling carriage concrete may be taken from the belt at any point along its length and may also be discharged through the spout at the end.

As the new work lay along the line of the creek, the first construction task was diversion of the streamflow. There were a number of methods practicable: diversion ditches capable of carrying varying percentages of the floods; ditches constructed at different levels with respect to the old creek and the new work; and ditches constructed at varying distances from the site of the work. Obviously the larger, the lower and the more remote from the work the ditch was made the more nearly would the work be completely free from flood interference and damage. Unfortunately, there is always a distinct temptation to economize on expenses of this kind and take the chance that there will be no floods.

Excavation and Drainage Methods

Section A, Fig. 1, was the first earth canal to be put under construction. It included 5,700 ft. of the cross-section shown by Fig. 8 and involved the removal of more than 200,000 cu.yd. of pay excavation besides a very large yardage in diversion ditches and in rehandling spoil. Bids were received Jan. 29, 1924; the city's estimate was $342,000, the low bid was $324,000, the second low was $408,000. There were several other bids a few thousand higher. The work was started in March, 1924, by the low bidder, who equipped it for excavation with several small draglines and steam shovels of 1-yd. or less capacity, and with one dragline of about 2½-yd. capacity.

Original Method Unsuccessful—Fig. 5 shows a general plan of section A. On it are indicated the main right-of-way along the center of which the new works were constructed, the creek as it existed at the beginning of the work and the diversion ditches that were employed from time to time.

The original contractor was responsible for the excavation of ditch 1 and of the ditch for the west fork of the creek. Ditch 1 was not quite so large as the original river channel, nor was its bottom carried down to the flow line of the creek so that the dam across the creek bed at this point impounded a considerable depth of water and much of this water was sewage.

Excavation on the main channel was started in April and almost from the beginning was subject to periodic flooding. This was due in part to the size and elevation of the diversion ditch, but in a much greater part to a season of unusually frequent heavy rains. On several occasions the dams broke and the first 400 or 500 ft. of excavated channel were filled with water. In one of these floods, June, 1924, one of the partners of the contracting company was drowned. Between floods the ditch was drained, but the soil had become thoroughly saturated and the lowering of the groundwater level produced a continual seepage from the banks, even after the floodwater was removed. The banks sloughed badly, the bottom of the ditch was deep in muck and the contractors came to the conclusion that the work could not be carried out in accordance with the plans.

After considerable discussion it was evident that the work could not be constructed in accordance with the plans and at the same time in accordance with the construction program on which the contractors had been

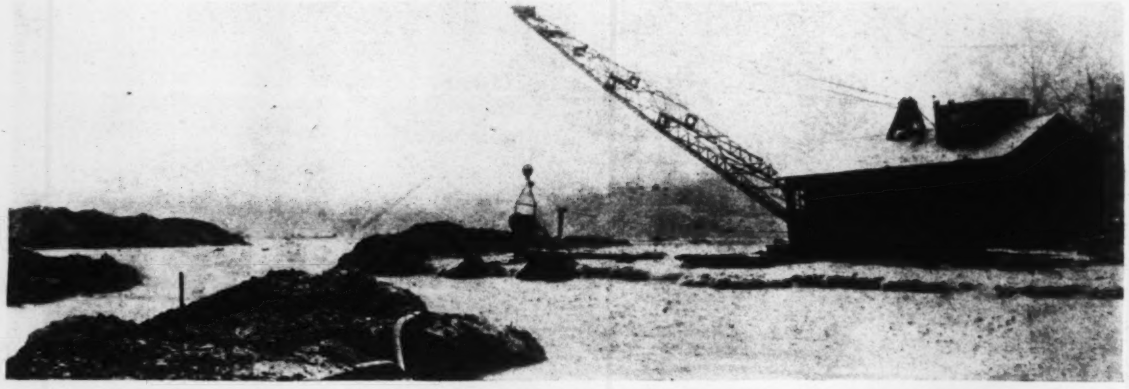


FIG. 4—A FLOOD PASSING THROUGH THE WORK
Virtually every heavy rain caused flooding. At one time the river remained in flood eight days and a deposit of silt more than 1 ft. deep in places covered the incompleted work.

figuring. They had assumed that the main channel could be excavated, and that immediately behind the excavating the trimming of the banks and the placing of the concrete lining could be carried out. The engineers urged that such a program was not essential and was distinctly undesirable, and advised the contractor to proceed with the main excavation, leaving the trimming and lining to follow at a later date.

This suggestion was not acceptable to the contracting company, which, as an alternative, requested that the plans be changed to provide a lining capable of holding up the banks. Although this was strictly contrary to the city's policy, the concrete lining being designed as a pavement only, an authorization for a change of plan for the first 500 ft. was made in the hope of getting the project going and of permitting a return to the original plan after better weather conditions prevailed.

Even on the changed plan, however, progress was not satisfactory. The contractor's resources began to appear to be inadequate, numerous disputes and contentions arose and finally in November, 1924, the contractor was ordered to cease work and the city took it over.

Second Contractor Changed Methods—A new contract was entered into with J. J. Dunnegan, the second low bidder on the basis of a guaranteed-price equivalent to his original bid for the undisturbed portions of the work, but on a force-account basis within this guarantee and a provision for sharing of any savings below the amount of the original bid. Provision was also made for the completion on a straight force-account basis of those parts of the work disturbed by the first contractor.

The Dunnegan organization constructed deep diversion ditches as far from the line of the work as practicable, pressed the excavation rapidly and delayed the trimming and lining until the seepage was greatly reduced.

At the time this company took charge about 800 ft. of the work was completed. This has involved the use of the extremely heavy reinforced lining and none of the work had been in exact accordance with the original plan. Diversion ditch 2 was in service and because of its high level the sewage flow was ponded for a long distance. The city forces had cut the dam at the head of this ditch and had abated this nuisance. Inasmuch as the ditch had also created a high-level reservoir tending to saturate the soil on the bank of the new channel, the Dunnegan company chose not to reopen it, and instead carried the dry-weather flow between stations 6 and 12 in a corrugated-

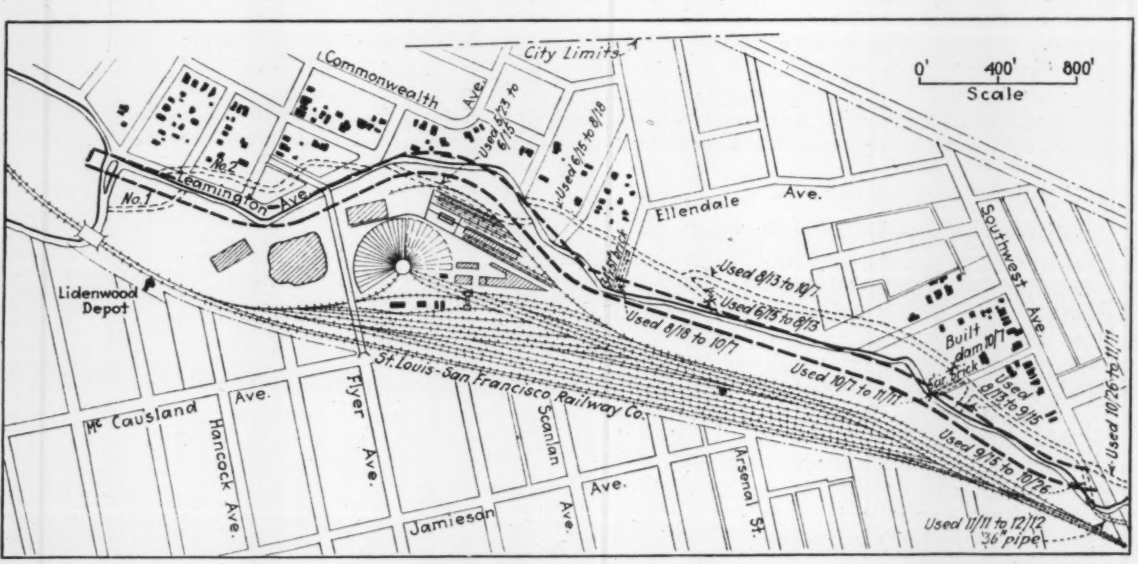

City Limits
Commonwealth Ave.
0' 400' 800'
Scale
Used 5/23 to 6/15
Used 6/15 to 8/18
No. 2
No. 1
Leamington Ave.
Ellendale Ave.
Lidenwood Depot
6'x5' brick
Used 8/13 to 10/7
Used 6/15 to 8/13
Used 8/18 to 10/7
Southwest Ave.
Built dam 10/7
Sar. brick
Used 8/13 to 9/15
Used 10/7 to 11/11
Used 10/26 to 11/11
St. Louis-San Francisco Railway Co.
Used 9/15 to 10/26
McCausland Ave.
Hancock Ave.
Flyer Ave.
Scanlan Ave.
Arsenal St.
Jamieson Ave.
Used 11/11 to 12/12 36" pipe

FIG. 5—MAP OF SECTION A AND PART OF B1
This map shows the narrow working space along the River des Peres and outlines the various types and locations of diversion ditches and flumes used for handling the creek flow.

metal flume laid in the bottom of the main channel after a part of the width had been excavated in the wet.

The diversion of the creek flow into this metal flume permitted the excavation and construction of the sanitary sewer. Above station 12 other diversion ditches were introduced as shown by Fig. 5 and the main excavation and construction of the foul-water sewer proceeded at a good rate, helped somewhat by a season appreciably drier than the preceding one. The construction of the lining, which was carried out in exact accordance with the original plan, was not begun until midsummer. At this time the groundwater table was lowered to the level of the new sanitary sewer, and the banks and bottom, where the first contractor's men had been knee deep in mud, were dry, firm and often dusty. This condition of the ground permitted rapid construction of the lining. The banks proved to be entirely stable, no slides or disturbances of the lining occurred except for 300 ft. alongside a new railroad fill.

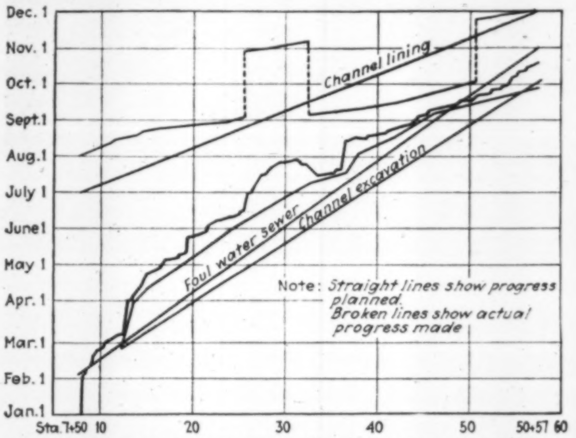


FIG. 6—PROGRESS CHART ON SECTION A UNDER THE SECOND CONTRACTOR

The contrasting progress between winter and summer work work is noticeable and the remarkable progress during the long dry spell is clearly shown.

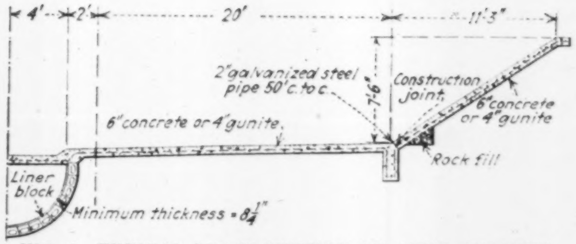


FIG. 8—TYPICAL CROSS-SECTION OF OPEN CHANNEL AND SANITARY SEWER

The concrete paving of the side slopes extends for the equivalent of a vertical height of 7 ft. This is about the expected height of the average annual flood. The "maximum design" flood will have a water depth of 18 ft.

The progress schedule and the actual progress by the second contractor are shown by Fig. 6. The significant fact is that where the first contractor, fighting mud and water continually, built 750 ft. of very expensive construction during 1924, the second contractor, by appreciating the importance of removing the groundwater, was able to work almost in the dry and actually to line as much as 1,600 ft. of channel in one month. The contrasting working conditions under the two operations are well illustrated by Figs. 7 and 9.

Construction of Sanitary Sewer and Concrete Lining

While the excavation of the main channel was the critical operation, the construction of the sanitary sewer involved real difficulties. As is shown in Fig. 8, this is a semicircular conduit of brick or segmental block, with the channel lining acting as a roof. The ditch, being well below the water table, was almost invariably wet. The trimming of the banks was often difficult on account of wet ground and the trench could not be left open for any great length of time.

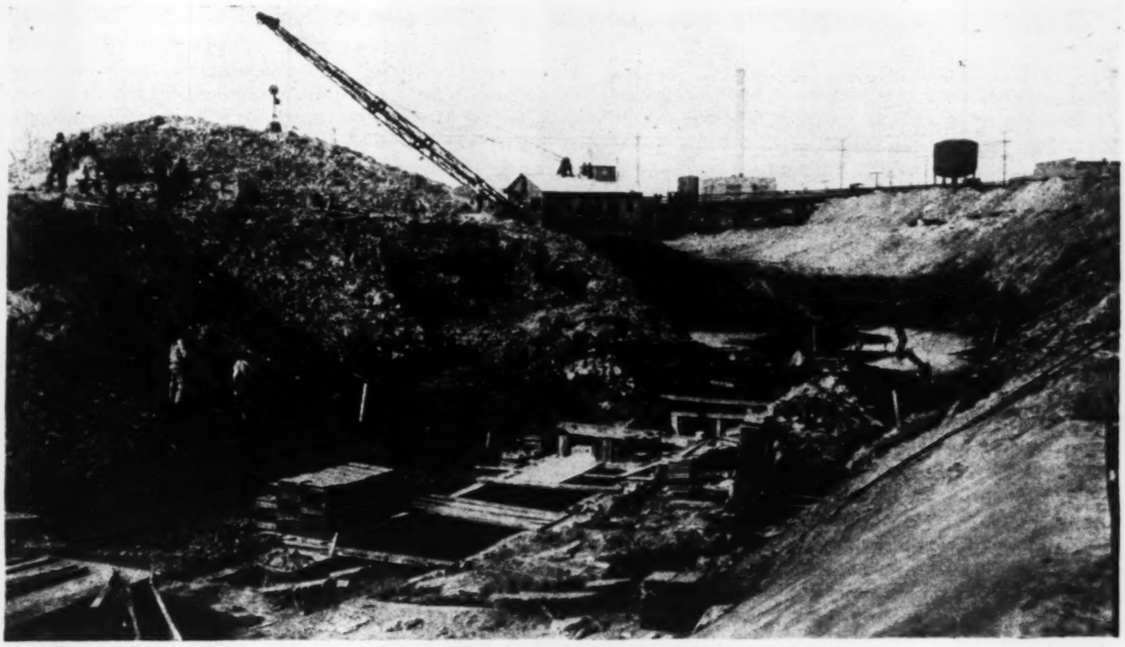


FIG. 7—CONSTRUCTION CONDITIONS WITHOUT ADEQUATE DRAINAGE

Shows the conditions that existed when it was attempted to construct a sanitary sewer under the lining as fast as the main excavation was carried out. A diversion ditch was in service behind the pile of dirt immediately to the left. It is noticeable how the left-hand bank is sloughing off in loose rolls and how the seep water collects at the head of the low-level sewer construction.

The channel lining over the sanitary sewer was at first placed on wooden forms built in the sewer, but the forms delayed progress, and because of frequent inundations were difficult to remove. Later this roof was constructed of precast slabs. This permitted faster work and also smoothed out the labor curve, as slabs could be cast when other work could not be carried on. The slabs were brought forward from a central yard on the railway that was used to handle concrete materials for the lining, and were lowered into the ditch and placed with one of the lighter travelling cranes. These slabs were reinforced and had U-bolts for handling.

For lining, the first contractor had set up material bins and cement sheds at a railway switch just west of the starting point, and had laid a light railway track for handling concrete aggregates to a mixer adjacent to the ditch. Material was loaded into batch boxes which were lifted off by a crane and discharged into the mixer. From the mixer the concrete was chuted into place. It had been the plan of the first contractor to use face forms to hold the concrete on the side slopes, but after these forms had been destroyed in one of the floods it was found that by producing concrete of the right consistency it could be laid and tamped without face forms. Concrete of the consistency necessary for this operation could not be chuted to the far side of the trench, so that great expense for scaffolding and for handling in concrete buggies was involved.

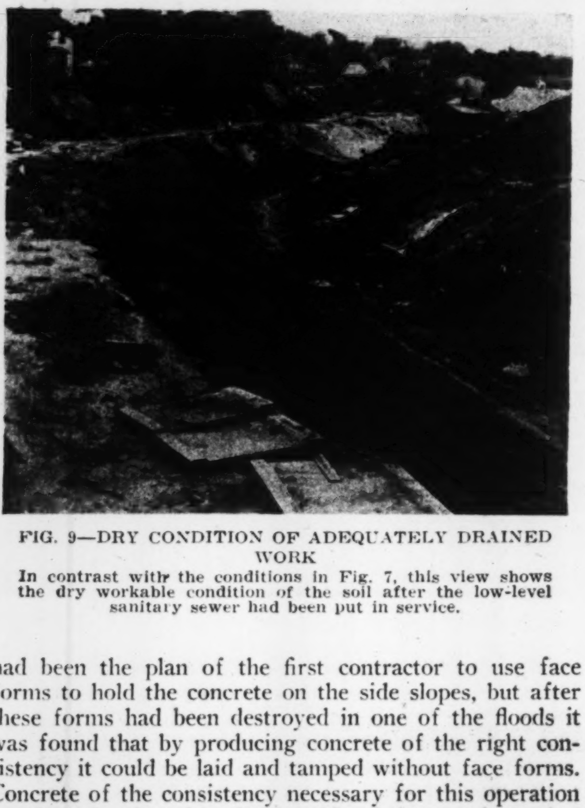


FIG. 9—DRY CONDITION OF ADEQUATELY DRAINED WORK

In contrast with the conditions in Fig. 7, this view shows the dry workable condition of the soil after the low-level sanitary sewer had been put in service.

The second contractor used the same equipment for transporting the aggregates, but found the method of handling the concrete in the trench too slow and expensive. The contractor's superintendent and the city's engineers worked out a plan for distributing the concrete by belt conveyors and had a traveling conveyor for this purpose manufactured in St. Louis (Fig. 3). With only slight readjustments this conveyor met the needs completely. It was easily movable along the trench, was equipped with stops which took the concrete off the belt at any point desired and with spouts which permitted placing the concrete with only a very small amount of shoveling and rehandling.

Placing the concrete in the bottom and screeding it were relatively simple, but deposition on the side slopes required delicate handling. The water content had to be carefully gaged to produce concrete of exactly the right consistency. Actually a very high degree of uniformity was secured. A heavy two-man wooden float, capable of tamping and screeding the full height of the side slope in one operation, was used. Occasionally a wetter-than-usual batch would give trouble, start sloughing and slow down the work, but during the summer months after the work became organized little of this trouble occurred.

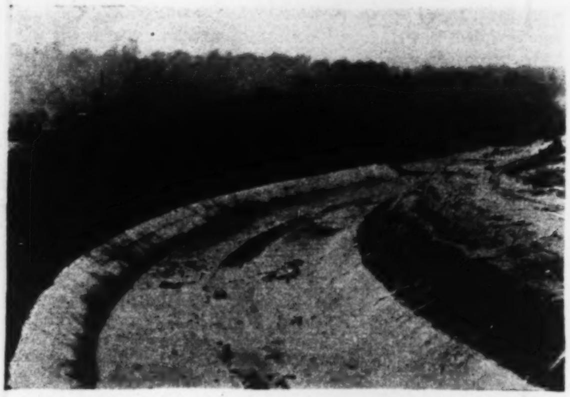


FIG. 10—SECTION OF COMPLETED CHANNEL IN EARTH

Cost of Section A

The work was completed in December, 1925, one year after the second contractor took charge. The contractor's cost, plus the 10 per cent fee, almost exactly equaled the amount of his guaranteed cost, so that no savings resulted. Without taking into account any possible awards or recovery from the litigation now in progress with the first contractor, the final cost of the work amounted to $442,000, compared with the city's estimate of $342,000 and the original contractor's bid of $324,000 and Dunnegan's original bid of $408,000.

Drainage Costly in Section B1

The contract for building subsection B1, which was channel in earth, was awarded to the contractor for section A on a cost-plus agreement by which he received a fee of 10 per cent on the whole cost excepting equipment, which was charged on a straight rental basis. This work was carried forward from the section A operations without pause. The contractor started in October, 1925, and the work was finally completed in July, 1926. The River des Peres in this section was confined to a deep valley generally not more than 200 ft. wide. There was no room for large diversion ditches throughout the first part of this work and the excavation had to be carried out largely in the wet, with a 36-in. pipe line which carried the dry-weather flow at the lowest stages of the creek. For the second half of the work a diversion channel was constructed under expensive conditions.

Heavy rains were frequent and the conditions shown in Fig. 4 are typical of the inundations encountered. Under these circumstances it is not surprising that the construction of about 1,200 ft. of channel, with the underlying sanitary sewer and the lining, required eight months' time and cost $151,000. This cost was more than 50 per cent greater per foot than that for section A and approximated closely the cost per foot of the succeeding B2 and C sections, where there was heavy rock excavation.

A succeeding article will describe the special contractual arrangement and the construction procedure for the open canal in rock bottom.

Seven New Mississippi River Highway Bridges

Remarkable Big Bridge Development in Two Years—Cantilever, Continuous Truss and Simple Truss Channel Spans—One Bridge Carries Railway Also—Six Projects for Other Bridges Include Suspension Spans

A RECORD in big bridge construction seems to have been established by the completion of seven new highway bridges across the Mississippi River in about two years. Moreover, six bridge projects are in preliminary or promotional stages. The completed bridges, in order, are at Quincy, Ill.; Louisiana, Mo.; Alton, Ill.; St. Louis, Mo.; Cape Girardeau, Mo.; Cairo, Ill.; and Vicksburg, Miss. The projected bridges are at Prairie du Chien, Wis.; Chester, Ill.; Natchez, Miss.; Baton Rouge, La.; and two at New Orleans. Of these thirteen highway bridges, the one at Vicksburg and three of the proposed structures provide also for railway traffic.

For the main channel spans, three of the completed bridges have continuous trusses, two have cantilevers and two have simple truss spans. Of the six proposed bridges, two are designed as cantilevers, one as a suspension bridge and one may have either a cantilever or a suspension span, while for the other two no definite plans have been prepared. The longest span is the 825-ft. cantilever of the Vicksburg bridge, next to which come the 700-ft. cantilevers of the St. Louis and Cairo bridges, while the shortest channel span is the 418-ft. truss of the bridge at Louisiana, Mo. A span of 1,760-ft. (cantilever or suspension) is proposed for one of the New Orleans bridges.

All the completed projects were backed by locally organized companies. Brief particulars of these several bridges are given below, the structures being listed in their downstream succession.

Quincy, Ill.—In this bridge, completed in the spring of 1930, the main feature is a continuous truss 1,256 ft. 8 in. long, forming two channel spans of 627 ft. 8 in. c. to c. of piers, as shown in Fig. 1. Its east approach, on a 12-deg. curve and 1 per cent grade, consists of one 34½-ft. and two 50-ft. I-beam spans; three 78-ft. girder spans and then a 99-ft. girder span. The west approach is a steel viaduct with sixteen I-beam spans of 51 ft. and eleven girder spans of 80 ft. The deck provides a 20-ft. roadway and two 4-ft. sidewalks.

This bridge was designed for the Quincy Memorial Bridge Co. by the Strauss Engineering Corp., Chicago. The river piers were built by the Foundation Co., while the Kelly-Atkinson Construction Co. built the east approach piers and erected all the steel. Work on the river piers was commenced in September, 1928, and although delayed by high water, it was completed in September, 1929. All structural steel had been erected by March 1, 1930.

Louisiana, Mo.—Five simple truss spans form the main part of the bridge (Fig. 2), with a channel span of 418 ft. 9 in. c. to c. of piers, flanked at each end by one of 314 ft. and then one of 313 ft. The east approach consists of six 96-ft. plate girder spans supported on bents, except for one 24-ft. tower. There are no west approach spans. The entire bridge has an ascending grade from the east end, with 3.5 per cent on the approach and 1.42 per cent on the main spans. The minimum headroom under the channel span is about 55½ ft. at high water. Carbon steel is used throughout. The concrete roadway slab, 20 ft. between curbs, is covered with 1 in. of rock asphalt. No sidewalks are provided. This bridge, opened May 12, 1928, was designed by Ash, Howard, Needles & Tammen, Kansas City, Mo., for the Missouri-Illinois Bridge Co., which was organized by the Chamber of Commerce of Louisiana, Mo. The substructure was built by the Missouri Valley Bridge & Iron Co., and the superstructure by the Wisconsin Bridge & Iron Co.

Alton, Ill.—Seven through-truss river spans include, from the east end, one of 284 ft., one of 445 ft. over the main channel, and five of approximately 284 ft., as shown in Fig. 3. The east approach has four through plate-girder spans of 60 and 85 ft., on steel piers, followed by nine deck-truss spans of 86 and 133 ft. on steel towers. Three 30-ft. concrete girder spans form the west approach. A grade of 2.3 and then 1.5 per cent rises from the east end; the two main spans are level and the grade descends at 3.45 per cent. A headroom of 86.8 ft. above low water at the channel spans (55.4 ft. at high water) decreases to about 39 ft. at the west end. Both carbon steel and silicon steel were used in the trusses. A concrete slab deck, 20 ft. between curbs, was surfaced with a concrete finishing-machine, an extra ½ in. of concrete being provided to form the wearing surface. There are no sidewalks. This bridge, opened on July 16, 1928, is 260 ft. downstream from that of the Chicago, Burlington & Quincy Railroad, which has nine river spans. The substructure was built by the Kansas City Bridge Co., and the superstructure by the Wisconsin Bridge & Iron Co.

To continue the same highway as far as St. Louis, the Missouri River was crossed at Bellefontaine, Mo., by four through-truss spans of 443 ft. c. to c. of bearings, with three 70-ft. girder spans at the east end and one of 60 ft. at the west end. This structure is 60 to 85 ft. downstream from the railroad bridge, which has similar river spans. Both the substructure and superstructure were built by the Kansas City Bridge Co., and the bridge was opened on July 21, 1928. The Mississippi and Missouri bridges were both designed by Ash, Howard, Needles & Tammen, Kansas City, Mo., for the Alton-St. Louis Bridge Co.

St. Louis, Mo.—In the bridge at Chain-of-Rocks, north of St. Louis, the main feature is a series of five continuous trusses forming ten spans. As shown in Fig. 4, the central truss gives two 700-ft. spans, while the others give eight spans of 350 ft. At the east end, a paved fill nearly 4 miles long extends from a connection with the state highway system at Mitchell, Ill., to an approach consisting of three 200-ft. through-truss spans. The west approach has two through-truss spans of 200 ft. and one of 150 ft. At the channel spans the clear headroom is 55 ft. at high water. Grades on the approaches are 2.5 and 2.63 per cent on the west and east sides respectively. This bridge, opened July 20, 1929, was built for the Chain-of-Rocks & Kingshighway Bridge Co.; it was designed by Baxter L. Brown and Edward

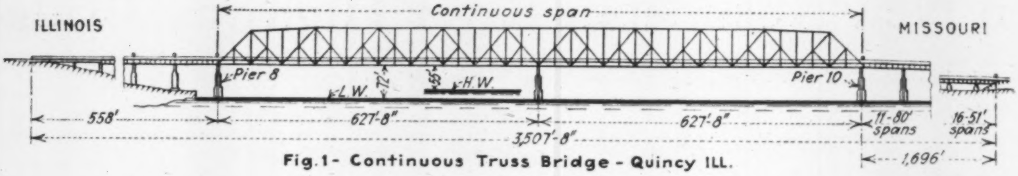

ILLINOIS
Continuous span
MISSOURI
Pier 8
L.W.
72'
55'
H.W.
Pier 10
558'
627'-8"
627'-8"
11-80' spans
16-51' spans
3,507'-8"
1,696'

Fig.1 - Continuous Truss Bridge - Quincy ILL.

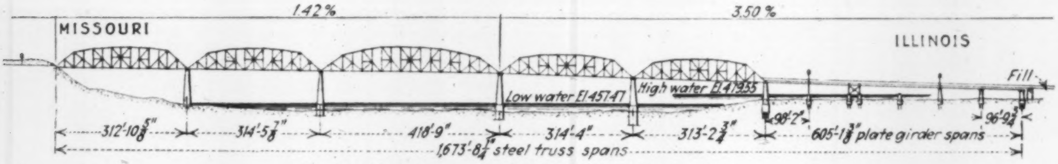

1.42%
3.50%
MISSOURI
ILLINOIS
Fill
Low water El.457.47
High water El.479.55
312'-10$\frac{5}{8}$"
314'-5$\frac{7}{8}$"
418'-9"
314'-4"
313'-2$\frac{3}{4}$"
98'-2"
96'-9$\frac{3}{4}$"
605'-1$\frac{3}{8}$" plate girder spans
1,673'-8$\frac{1}{4}$" steel truss spans

Fig.2 - Simple Truss Bridge - Louisiana Mo.

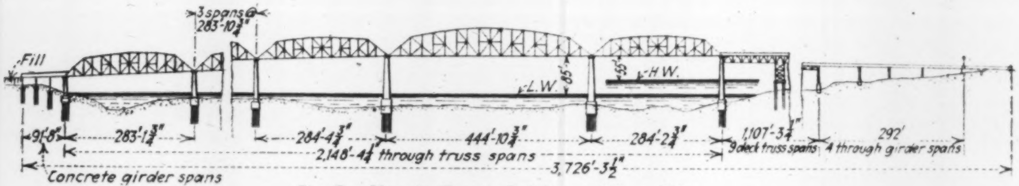

3 spans @ 283'-10$\frac{3}{4}$"
Fill
L.W.
85'
55'
H.W.
91'-8"
283'-1$\frac{3}{4}$"
284'-4$\frac{3}{4}$"
444'-10$\frac{3}{4}$"
284'-2$\frac{3}{4}$"
1,107'-3$\frac{1}{4}$"
9 deck truss spans
292'
4 through girder spans
2,148'-4$\frac{1}{4}$" through truss spans
3,726'-3$\frac{1}{2}$"
Concrete girder spans

Fig. 3 - Simple Truss Bridge - Alton ILL.

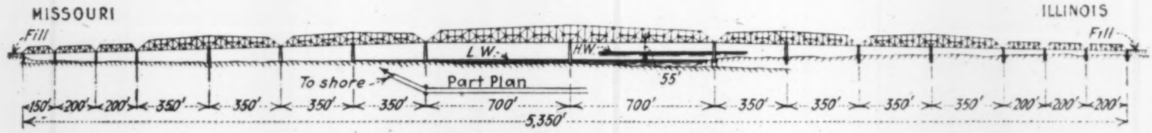

MISSOURI
ILLINOIS
Fill
Fill
L.W.
H.W.
55'
To shore
Part Plan
150'
200'
200'
350'
350'
350'
350'
700'
700'
350'
350'
350'
350'
200'
200'
200'
5,350'

Fig.4 - Continuous Truss Bridge - St. Louis

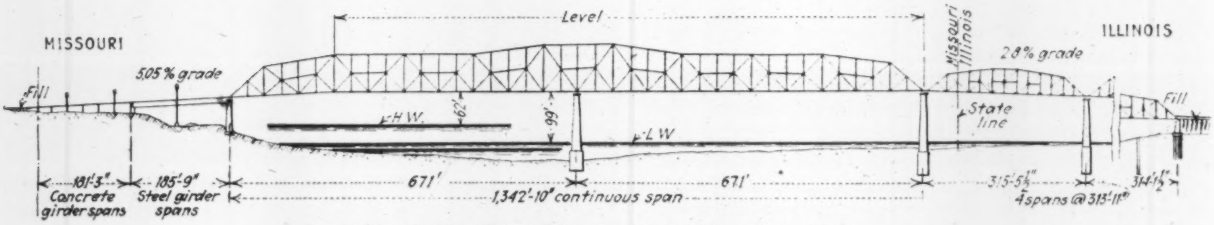

Level
MISSOURI
Missouri
Illinois
ILLINOIS
5.05% grade
2.8% grade
Fill
Fill
H.W.
62'
99'
L.W.
State line
181'-3"
Concrete girder spans
185'-9"
Steel girder spans
671'
671'
1,342'-10" continuous span
315'-5$\frac{1}{2}$"
4 spans @ 315'-11"
314'-1$\frac{1}{2}$"

Fig.5 - Continuous Truss Bridge - Cape Girardeau Mo.

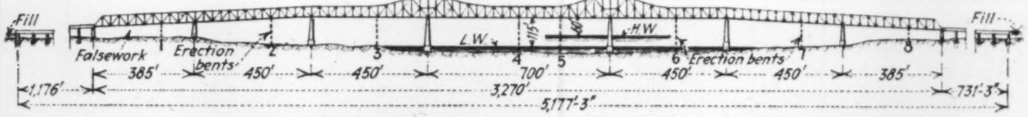

ILLINOIS
MISSOURI
Fill
Fill
L.W.
115'
60'
H.W.
Falsework
Erection bents
1
2
3
4
5
6
7
8
Erection bents
385'
450'
450'
700'
450'
450'
385'
1,176'
3,270'
731'-3"
5,177'-3"

Fig.6 - Cantilever Bridge - Cairo ILL.

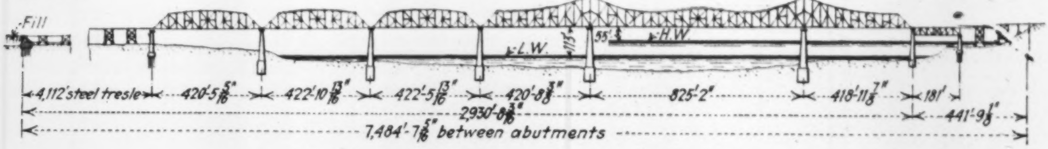
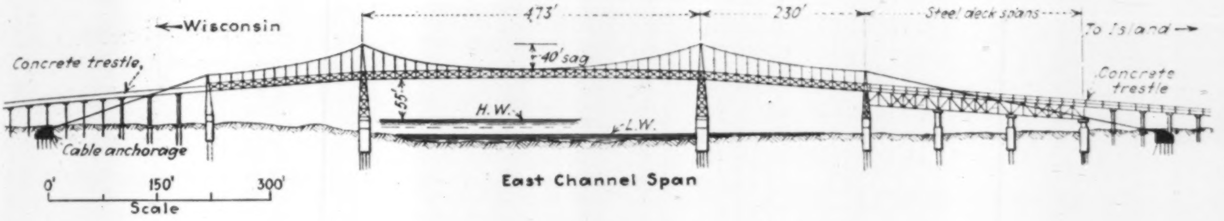

West End
East End
Fill
L.W.
115'
55'
H.W.
4,112' steel tresle
420'-5$\frac{5}{16}$"
422'-10$\frac{13}{16}$"
422'-5$\frac{13}{16}$"
420'-8$\frac{3}{8}$"
825'-2"
418'-11$\frac{7}{8}$"
181'
2,930'-8$\frac{3}{16}$"
441'-9$\frac{1}{8}$"
7,484'-7$\frac{5}{16}$" between abutments

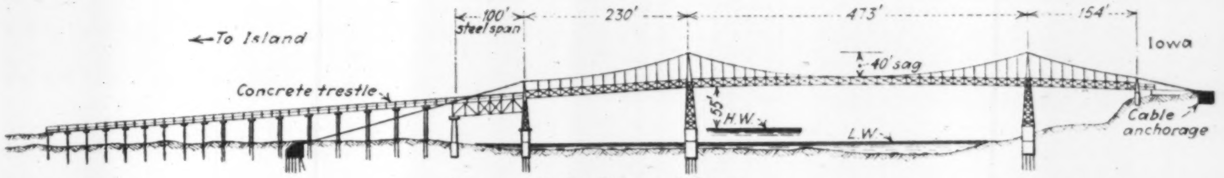
Fig.7 - Cantilever Bridge — Vicksburg Miss.

SEVEN NEW HIGHWAY BRIDGES OVER THE MISSISSIPPI

Each of the bridges was built as a toll project financed by locally organized companies. In addition to a highway crossing, the Vicksburg bridge carries a single-track railroad that will be used by the Yazoo & Mississippi Valley Railroad and replaces the long-used car ferries at this point.



East Channel Span



Main Channel Span

FIG. 8—PROPOSED SUSPENSION BRIDGE, PRAIRIE DU CHIEN, WIS.

B. Fay, consulting engineers, St. Louis, Mo. The contractors were the Union Bridge & Construction Co. for the substructure and the American Bridge Co. for the superstructure.

An unusual feature of this bridge is that the west end, from the 700-ft. channel span, is at an angle of about 30 deg. with the main part of the structure (see Fig. 4). The original design was on a straight line, but navigation interests objected that boats bound downstream would have difficulty in steering so as to clear both the bridge pier and the intake tower of the St. Louis water-works. After arguments on both sides, the objection was supported by the War Department and the company was directed to place the mid-channel pier on the axis of the intake tower and not more than 250 ft. from it. This location extended westward would have intersected the water-works plant, and the only alternative was to divert the approach in order to reach property north of the water-works. The sharp turn on the bridge is protected by special signs and signals, so that traffic will not be appreciably slowed down.

Cape Girardeau, Mo.—A continuous truss forming two channel spans of 671 ft. c. to c. of piers is the main feature of this bridge (Fig. 5). At the east end are six through-truss spans, one of 315½ ft. and five of 314 ft., all on a grade of 2.8 per cent. At the west end there are two steel girder spans of 87 and 96 ft. and six concrete girder spans of 30 ft., with a grade of 5 per cent descending to the west. At the channel spans the headroom is 62.8 and 99.3 ft. above high and low water respectively.

A reinforced-concrete deck slab forms the roadway, 20 ft. between curbs, and has a wearing surface of asphaltic concrete. Some silicon steel was used in the trusses having an ultimate strength of 80,000 to 95,000 lb., with a minimum yield point of 45,000 lb. The carbon steel has an ultimate strength of 55,000 to 65,000 lb. On the 1,342-ft. continuous-truss, the trusses are spaced 30 ft. c. to c., but on the shorter spans this distance is 23 ft. 8 in. With this latter spacing, the guard railings are attached to the truss members, but on the wider long spans they are carried by braced posts mounted on the floorbeams. This bridge, opened Sept. 3, 1928, was built for the Cape Girardeau Bridge Co., organized by the local chamber of commerce. It was designed by Ash, Howard, Needles & Tammen, Kansas City, Mo. The substructure was built by the U. G. I. Contracting Co. and the superstructure by the American Bridge Co.

Cario, Ill.—A cantilever channel span of 700 ft. c. to c. of piers, with a 254-ft. suspended span, is the principal feature of this bridge, which is shown in Fig. 6. On each side this main span is flanked by a 450-ft. anchor span followed by a 450-ft. cantilever span (with 256-ft. anchor or short span). The Illinois approach is a viaduct with 21 spans of 56 ft., while the Missouri approach has thirteen spans of 56 ft. 3 in. on a curve of 2,000-ft. radius. These are all girder spans carried on thin piers having concrete pile foundations. Both approaches are level, followed by grades of 5 per cent on the first two spans and then 0.5 per cent to the middle of the channel span. The headroom at this span is about 60 ft. at high water.

The eight main piers were sunk by open dredging, this work being rather difficult on account of the firm material encountered. In erecting the main spans, they were cantilevered progressively from the Illinois end, using eight heavy falsework bents, as shown by the dotted lines in Fig. 6. There were also seven falsework bents under the Cairo end of the first span, as indicated. The operations of both substructure and superstructure contractors were interrupted several times by high water. This bridge, built for the Cairo Bridge & Terminal Co., has a 20-ft. roadway between trusses spaced 25 ft. c. to c. It was designed by Waddell & Hardesty, consulting engineers, New York, N. Y. The substructure was built by the Missouri Valley Bridge & Iron Co., and the superstructure by the American Bridge Co. The bridge was opened in September, 1929.

Vicksburg, Miss.—This combined highway and railway bridge, Fig. 7, has a cantilever channel span of 825 ft., with anchor arm spans of 420 ft. From the east abutment a 260-ft. steel viaduct and 181-ft. deck truss extend to the anchor span. From the west abutment there is a steel viaduct 4,112 ft. long, consisting of 46 girder spans of 60 ft. and 45 tower spans of 30 ft. Three through-truss spans of about 423 ft. extend from the viaduct to the anchor-arm span. At the channel span the minimum headroom is 60 ft. above high water and 115 ft. above low water. The deck carries a single railway track and a concrete roadway 18 ft. between curbs, the slab having a special surface treatment and its thickness being made sufficient to allow for wear.

This bridge was designed for the Vicksburg Bridge &

Terminal Co. by Ash, Howard, Needles & Tammen, consulting engineers, Kansas City, Mo. The contractors are the U. G. I. Contracting Co. for the substructure; the American Bridge Co. for the main spans; and the Virginia Bridge & Iron Co. for the approaches. It is to be opened in the summer of 1930.

Projected Bridges

Prairie du Chien, Wis.—A highway bridge to supplant the steamboat ferry has been projected by local interests, but bond market conditions during 1929 interrupted the financing negotiations and nothing further has been done. An island in the river necessitates two bridges, each to be of the cable suspension type with a 473-ft. channel span and steel towers. These two proposed structures are shown in Fig. 8. The flanking spans, suspended from the cables, are 215 and 230 ft. for the east channel, and 230 and 154 ft. for the west or main channel, this last short span extending to high ground. The island is to be crossed by earthfills and concrete trestles, with three 100-ft. deck truss spans to the east channel bridge and one similar span to the west channel. Approach grades are 5 per cent on the west side and 6½ per cent on the other three approaches.

It will be noted that all the cables extend beyond the flanking spans and are supported by low towers over the shore ends of these spans. Owing to the low ground of the island and east side, the cables from three of the flanking spans have to extend through the approach viaducts for 200 or 400 ft. to the anchorages, but on the west side the distance from end tower to anchorage will be only about 100 ft. This bridge has been designed by the Austin Bridge Co., Dallas, Tex.

Chester, Ill.—The project for a bridge at this point awaits financing arrangements. The consulting engineers are Robinson & Steinman, New York, N. Y.

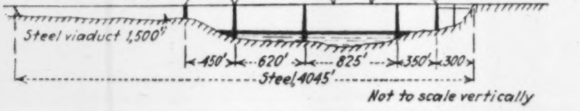


FIG. 9—DIAGRAM OF PROPOSED CANTILEVER BRIDGE AT NATCHEZ

Natchez, Miss.—This bridge, which is also awaiting financial negotiations, will have both an 18-ft. concrete roadway and single-track railway on one deck, as in the Vicksburg bridge, described above. As shown in the diagram (Fig. 9), a cantilever channel span of 825 ft. will have a 350-ft. anchor-arm span on the east side and a 620-ft. anchor span on the west side. This unsymmetrical arrangement arises from the necessity of placing the piers at certain locations to meet navigation requirements. As different sides of the river are used at different stages of the water, the War Department required one channel 800 ft. wide and another 600 ft. wide. The clear headroom at the middle of the 825-ft. span is 70 ft. and 126 ft. at high and low water respectively. It is somewhat less under the 620-ft. anchor span.

Two 150-ft. deck girder spans will constitute the east approach. On the west side there will be a 450-ft. through-truss shore span followed by 1,500 ft. of viaduct having 60-ft. girder spans and 30-ft. tower spans. An ascending grade from the west is 1.5 per cent on the viaduct, 0.82 per cent over the main spans and 0.47 per cent to the east end. The highway and railway grades separate at the ends of the bridge. This bridge has been designed for the Natchez-Vidalia Bridge & Terminal Co. by Ash, Howard, Needles & Tammen, consulting engineers, Kansas City, Mo.

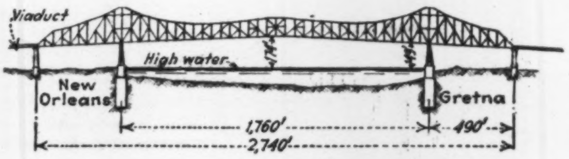


FIG. 10—PROPOSED CANTILEVER BRIDGE AT NEW ORLEANS

Baton Rouge, La.—A local concern, the Baton Rouge Bridge & Terminal Co., secured an act of Congress a few years ago for a toll bridge for combined highway and railway service, but this project has not been financed and no definite plan has been adopted. Tentative plans were made some years ago by Ralph Modjeski, consulting engineer. More recently a project for a railway bridge has been put forward, but no action has been taken to design such a crossing.

New Orleans, La.—Two separate bridge projects in this vicinity are now in their preliminary stages. The New Orleans Public Belt Railway Commission, a municipal authority, proposes a highway and railway bridge 2 miles north of the city limits, in a straight reach of the river between Nine-Mile Point and Twelve-Mile Point. Plans have been approved for a structure having a central span of 750 ft. in the clear (790 ft. c. to c. of piers), with a vertical clearance of 155 ft. above mean Gulf level and 135 ft. at a stage of 20 ft. on the Carrolton gage. Flanking this span on each side will be a through-truss span of 500 ft. (520 ft. c. to c.) and two deck spans of 530 ft. and 335 ft. The length from shore to shore will be 3,480 ft. The remainder of the structure, behind the levees, will be steel viaducts. This bridge is to carry two 18-ft. roadways and a double-track railway. A bond issue of $15,000,000 has been authorized by the state of Louisiana for the project. The consulting engineer for the Belt Railway Commission's bridge is Ralph Modjeski, New York, N. Y.

The Hero-Hackett project is for a highway bridge near the business section of the city. The War Department has objected to its location as being unfavorable to navigation, but has consented to a reconsideration of the project. Either a cantilever or a suspension bridge may be built, but the soft ground offers difficulties for anchorages for the latter. The main piers would extend about 200 ft. below low water to a bed of fine hard-packed sand. The tentative plans for a cantilever structure, Fig. 10, provide a central span of 1,760 ft. c. to c. of steel piers (750 ft. suspended span), with a clear headroom of 175 ft. at the center and 150 ft. at the piers above high water, or 20 ft. on the Carrolton gage. The two anchor arms would be 490 ft. With trusses 60 ft. c. to c. the bridge provides for a 40-ft. roadway and two 6-ft. sidewalks. A novel feature in the approaches is the use of spiral ramps of about four turns each, enabling an entire approach to be placed within one city block, thus reducing property damages. The Mississippi River bridge at Hastings, Minn., has spiral ramp approaches, each making one complete turn. The New Orleans spirals would be double-decked with separate double-pitch helices for the ascending and descending roadways. Waddell & Hardesty, New York, are the consulting engineers.

Letters to the Editor

Unsupported Length Ratios in Steel Deck Floors

Sir—In Lee H. Miller's answer to my letter *(Engineering News-Record,* Feb. 20, p. 338) regarding his proposed steel plate floor system he has unfortunately made an error of exactly 100 per cent in justifying this construction, and this error puts it outside of any of established rules in the practice of structural design. He has mistaken my quoted flange-overhang to thickness ratio as the same as an unsupported length to thickness ratio, which latter happens to be twice the former. His construction is comparable, by his contention, to the unstiffened distance vertically in a plate girder web, which is allowed to be 60 times the plate thickness in the case of the unstiffened spacing of 3-in. I-beams at 24 in. for a $\frac{3}{16}$-in. plate used as the upper flange. This gives him an unsupported distance of almost 120 times the thickness of the plate.

In the writer's long experience with various phases of structural design and construction he has never seen such unsupported ratios used, and the average designer would be very little influenced by what was done in secondary decks of steel ships. Such thicknesses as $\frac{3}{16}$ in. would not be used in the main decks of important ships and even so would have no particular bearing on our structural design specifications for buildings.

The engineering profession would like an opportunity to study in detail the results of a test on this construction, for the more common cases of free and partly restrained end conditions. Particularly, strain-gage readings in the plate should be carefully analyzed, as the plate has all the shearing and buckling stresses of a plate girder web in addition to the transverse bending stresses caused by carrying the load to the 3-in. I-beams from the floor. Mr. Miller has overlooked the fact that shearing stresses in this plate flange are required to transfer the direct stresses laterally to the 3-in. I-beam and that his case is more complicated than that of the plate girder web to the extent of the transverse bending in the plate.

G. A. Maney,
Professor of Structural Engineering,
Northwestern University.

Evanston, Ill.,
March 19, 1930.

Sanitary Conditions in China

Sir—The Chinese engineering graduate students here at Cornell have asked me to submit to you a letter concerning the sanitary situation in China. They feel that Professor Babbitt's interesting article on "Sanitation in China," which appeared in your issue of March 20, 1930, p. 484, is apt to convey (unintentionally to be sure) the wrong impression to the American engineering profession. In what follows I have given some of my own observations, made during my recent year in China.

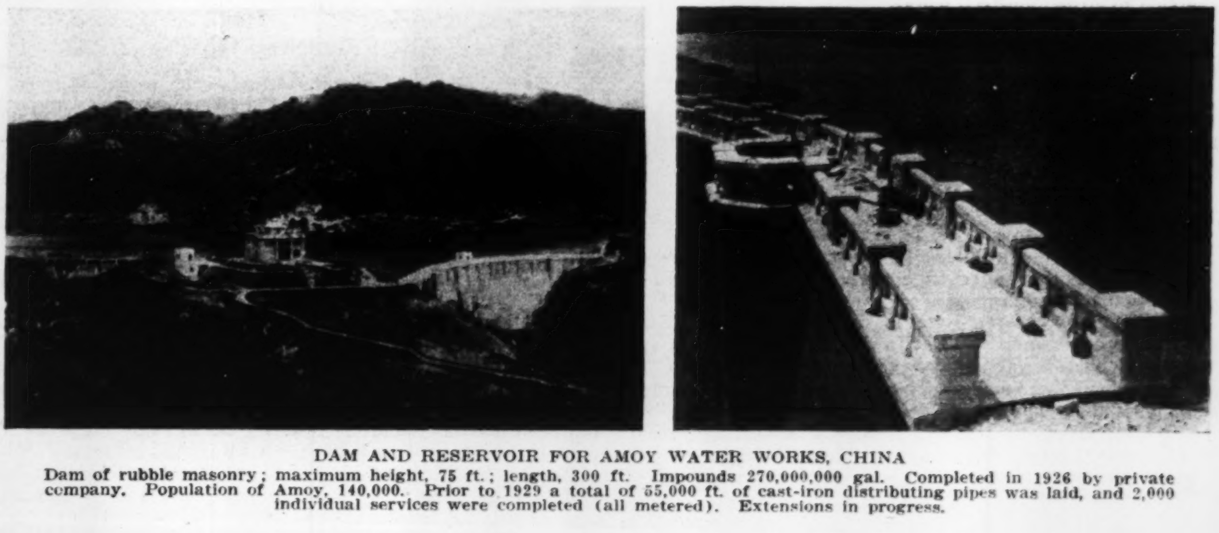
It is a well-known fact, and rather unfortunate, that the average visitor in China discovers the bad conditions in that country immediately upon arrival, and usually leaves before his impressions are corrected or modified. China is a most interesting country because of its quaint constructions, anomalous customs and unparalleled mannerisms. It is true that it has, in places, its exclusive odors and characteristic noises, some of which undoubtedly offend at first the senses of the fastidious Occidental. But after all, a careful and persistent observer can find places in our own United States which compare quite favorably with China's worst.

Professor Babbitt indicates some of the more undesirable (or should I say obnoxious) customs that prevail in parts of China. His article unfortunately gives one the impression that the foreigner in China has to contend with all of these conditions wherever he travels. As a matter of fact the average American, or Briton, or German, or what not, and also the Chinese of the higher classes, need never come into contact with any of these conditions. Foreign business interests are confined principally to the coastal cities, and tourists can get sufficient local color from the neighboring small villages to satisfy all but the most curious or adventurous. In these larger cities every modern convenience is available, including complete water-supply systems—which, while probably not efficient enough to warrant drinking the raw water, are thoroughly satisfactory for bathing purposes—luxurious hotels, automobiles, and plenty of cheap service. In some of these cities complete sewage-disposal systems have been installed. It is true that the average foreigner will not eat uncooked vegetables because of the fact that human excreta are used too frequently as fertilizer and hence the danger of cholera, typhoid and kindred diseases is too great to risk. Boiled or distilled water, tea, coffee, etc., are easily obtained, cooked vegetables are cheap and plentiful, and so these inconveniences may well be stricken from the list of possible unpleasant experiences.

That all sanitation construction has not been stopped by the internal squabbles is evidenced by the fact that there have been completed recently, or there are under construction, several water-supply projects, some of which are for Kirin, Amoy, Chinkiang, Huchow, Wuchow, Hungchow, Nanking and Mukden.

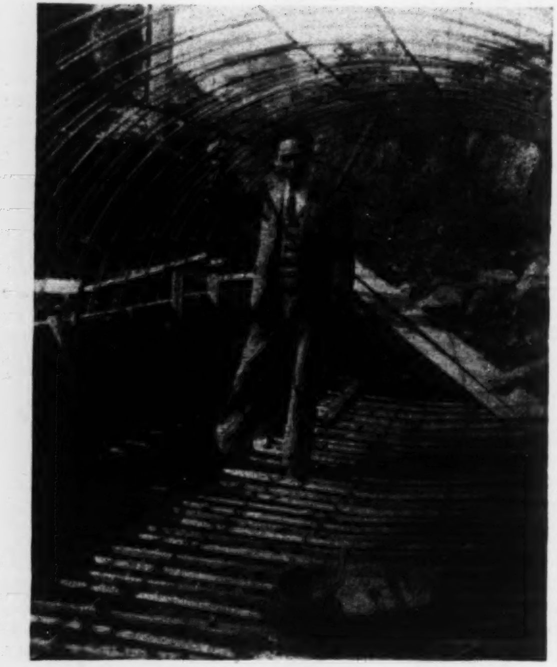
While storm sewers have been installed in many cities, sanitary sewer construction has not received the attention that should be given to this important health factor. China's problem is somewhat different from that of the Western nations, in that the solid matter must be saved for use as fertilizer. The average Chinese farmer cannot afford to buy chemicals for this purpose. The importance of this matter is understood by the Chinese, and studies are being made which will effect a satisfactory solution of the problem, and no doubt the necessary financial assistance will be forthcoming at the proper time.

The China Year Book (1929) states that the primary



DAM AND RESERVOIR FOR AMOY WATER WORKS, CHINA

Dam of rubble masonry; maximum height, 75 ft.; length, 300 ft. Impounds 270,000,000 gal. Completed in 1926 by private company. Population of Amoy, 140,000. Prior to 1929 a total of 55,000 ft. of cast-iron distributing pipes was laid, and 2,000 individual services were completed (all metered). Extensions in progress.



STORM SEWER FOR WUCHOW, KWANGSI PROVINCE, CHINA

Reinforced-concrete main storm sewer now under construction. Size, 6x8 ft. Total length of this portion, about 2,000 ft. Prior to 1929 a total of 35,000 ft. of smaller connecting sewers was completed. Materials used in the construction of the latter were brick (from the old city wall) and concrete. The main sewer discharges into the West River, which has its estuary at Canton.

Oriental diseases—bubonic plague, cholera, typhoid, dysentery and smallpox—have shown a marked decrease in the past four years. Recently $500,000 was allocated by the Nanking government for the development of a public health service. In spite of the urgent calls for expenditure in many lines, $100,000 of this is already available.

China is undoubtedly behind most civilized countries in the matter of sanitation, but she is progressing. This progress has been more marked in the last five years than ever before, and there is every reason to believe that it will continue. There are several handicaps which must be overcome before she can begin to approach the ideal. Chief among these are the ignorance of a great majority of the people, military domination, the lack of a stable and responsible central government, impaired credit because of past performances, the scarcity of modern engineering constructions and a hereditary indifference, which might well be characterized as a marked aversion to large industrial works.

China is waking up. She realizes her shortcomings. Eventually she will catch up. She needs encouragement. Let's give it to her, for Young China deserves it.

Charles E. O'Rourke,
Assistant Professor of Structural Engineering,
Ithaca, N. Y., Cornell University.
May 1, 1930.

Engineers Bidding in Competition

Sir—I desire the privilege of indorsing your editorials and articles on the subject of engineers submitting bids in competition for engineering work.

This condition, as you state, is very largely the fault of the engineers themselves. Public officials will cease to advertise for bids of this nature when reputable engineers decline to submit their tenders. I trust that you will continue to hammer this condition until it is generally recognized by the engineering profession that competitive bidding should be pronounced unethical.

John D. Spinks,
Winston-Salem, N. C., Municipal Engineer.
June 28, 1930.

Opinion on a Culvert Failure

Sir—Nineteen hundred years ago Jesus Christ made the statement that a house built upon sand will fall and great will be the fall thereof. This was probably an accepted axiom among engineers of that day and generation. At any rate it has not been deemed necessary in modern times to attempt to demonstrate its truth.

It would appear logical to assume that the same law would hold true concerning a cast-iron culvert pipe under a rock-fill, but it has remained for the Iowa state highway commission to develop the substantiating evidence submitted in Mr. Spangler's article in the *Engineering News-Record*, June 5, 1930, p. 931.

Long-accepted customs of providing a firm bed for the pipe or of placing it in a concrete cradle if subjected to heavy loading were thrown into the discard in favor of an earth cushion under the pipe. The results, as might be expected, were disastrous. Pipe of a quality capable of safely sustaining fills of 40 ft. and more when properly bedded failed under fills of less than half this depth. It is a pity that so much money was wasted at a time when culvert design and loading conditions are receiving widespread attention and funds are needed for more thorough study, but it will be a much greater pity if the results obtained tend to destroy confidence in the ability of a widely used commodity to function under reasonable and proper conditions.

Joseph S. Lambie,
Associate Professor of Civil Engineering,
Pittsburgh, Pa., University of Pittsburgh.
June 20, 1930.

Higher Strength Tests of Frozen Concrete

Sir—The article, "Thin Bridge Floors Concreted in Vermont Winter," in *Engineering News-Record*, June 19, 1930, p. 1002, is of particular interest to the writer because of its statements concerning higher strength test results obtained with frozen concrete.

In November and December, 1927, while building concrete roads in the village of Rye, N. Y., I controlled the concrete by means of a cross-bending machine similar to the one used in the Vermont work. On this concrete work I based a thesis called "Control of Concrete for Paving Purposes" which is on file at New York University. Among the studies was "The Effect of Freezing on Concrete," which portion follows:

> Expected results were obtained on mostly all tests until a cold spell of two days when about 20 deg. was reached. Even beams 36 hours old, if then frozen, would break at extremely high moduli and when thawed out would break normally.
>
> Tests of beams just prior to this period were normal, but during this cold period the results jumped to unbelievable heights as shown:

Age	Before Cold, Modulus of Rupture, Lb. Per Sq.In.	Age	During Cold, Modulus of Rupture, Lb. Per Sq.In.
18	563	22	994
12	392	14	866
11	370	13	1,115
29	620	44	1,049

> These results seemed absurd, but inspection of the machine, which was set up out of doors, showed everything to be working as it should. A few beams were taken into a warm place and after thawing were tested, with the result that the strengths obtained dropped back to normal. These beams did not freeze before this cold weather and had been showing an appreciable gain in strength. For beams which had frozen after the age of 30 or 40 days the moduli of rupture increased about 100 per cent and after thawing returned to normal. The results of all these frozen beams were not used in the curves. Whether or not concrete is stronger when frozen after having gained considerable strength is not absolutely known, but these results show an interesting phase of concrete testing. Whether the affecting factors are tension in ice, molecular action, or what not, is left for those interested to determine.

I am writing this to substantiate working results obtained by the Vermont highway department in 1928. I am glad that someone has found the results I did in 1927.

Ray W. Murphy,
Beacon, N. Y., Resident Engineer.
June 25, 1930.

News of the Week

Detroit's Public Works Head Resigns After Mayor's Recall

Following the decisive majority vote in favor of the recall of Mayor Charles Bowles by voters of Detroit at a special election July 22, John Gillespie, who was appointed commissioner of public works by Mr. Bowles to replace John W. Reid, has resigned. Mr. Gillespie was particularly active in connection with investigations of the Southfield sewer failures, as described in *Engineering News-Record* of July 3, 1930, and preferred charges against City Engineer Perry A. Fellows which were dismissed when Mr. Fellows was reinstated by the civil service commission. Mr. Gillespie and Mayor Bowles repeatedly referred to the investigations under way concerning the Southfield sewer in campaign speeches prior to the recall election, in answer to the charges that inefficiency and chaos were rampant in the city administration.

One of the specific charges against Mayor Bowles appearing on the recall petition was that "he destroyed efficient public service through dismissal of faithful employees." Two other charges named Mr. Gillespie specifically.

Colorado River States Discuss Allocation of Water

Governors, engineers and attorneys from the four upper basin states of the Colorado River met on July 21 in Denver jointly with U. S. Reclamation Service representatives with a view to securing all possible information bearing on water priorities, water flow, irrigation possibilities, feasible reclamation sites and the amount of land that may be brought under economic reclamation in a comprehensive plan intended to cover possibly a century of time.

Elwood Mead, chief of the U. S. Reclamation Service, presided at the session. With him was Raymond F. Walter, chief engineer in the Denver office. From the conference was developed a Colorado River planning commission which is to meet William Donovan, President Hoover's appointee, in Denver Aug. 22, when it is hoped that Colorado River waters can be allocated in a manner satisfactory to Colorado, New Mexico, Wyoming and Utah.

By the Boulder dam act $150,000 was appropriated to finance preliminary work in conjunction with such a fact-finding commission as was organized. Three states announced they are ready with exhaustive reports on water conditions, requirements and supply, and Utah promised to be ready within 30 days.

Saguenay River Diverted for New Water-Power Plant

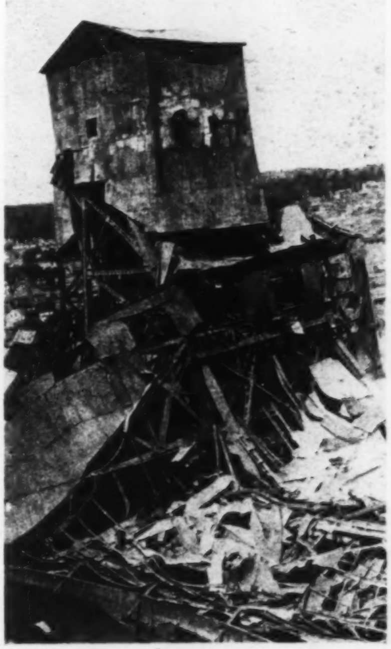
Narrow Rock Channel Closed by Tilting Into It a Dam of Concrete Built in Vertical Position

DIVERSION of the swift Saguenay River to a newly excavated channel at the power plant now under construction at Chute a Caron in northeastern Quebec was successfully completed on July 23. As ordinary methods of diversion would not suffice on account of the river flow of 40,000 sec.-ft. at a velocity of twenty feet per second, a novel method of closing off the river, proposed by James W. Rickey, hydraulic engineer of the Aluminum Company of America, was adopted.

How Work Was Accomplished

During the early stages of construction of the dam (see *Engineering News-Record*, Dec. 5, 1929, p. 889) a diversion channel which ultimately will serve as an intake channel and tailrace was excavated parallel to the river at the dam site. Meanwhile the dam was built out from both sides of the river, leaving only the deep and narrow river gorge

Continued on p. 188



RESULT OF FIRE IN ALL-STEEL MINE SHAFT HEADHOUSE AT LEAD, S. D.

Progress on San Francisco Bay Airdrome at Alameda

The transport area of the San Francisco Bay Airdrome, Alameda, Calif., located less than 2 miles from the business center of Oakland, 5 miles from San Francisco and in the center of Alameda's industrial activities, has been completed. Two runways of washed oyster shell 5 to 8 in. deep have been laid, one north and south measuring 1,650x200 ft. and the other east and west 3,800x400 ft. The washed oyster shell gives a sufficiently hard yet resilient surface.

Construction of the first hangar unit, rectangular in shape and 440 ft. long by 120 ft. wide, with three 120-ft. openings, has also been completed. This building will house temporary offices for the Airdrome company and the airlines making this field their headquarters.

$500,000 Fire Damages Steel Shafthouse of Homestake Mine

Fire of undetermined origin on July 10 wrecked the steel shafthouse, including the headframe, engine and compressor rooms, of the Ellison shaft of the Homestake gold mine at Lead, S. D., causing damage estimated at close to $500,000 and killing two men. The fire was remarkable in the fact that although there was very little wood construction in the buildings, the intense heat twisted heavy structural steel members into a shapeless mass, as can be seen from the accompanying illustration. The buildings were of steel construction covered with corrugated iron except for wood roofs and a few wood platforms.

Eyewitnesses state that flames swept through the shafthouse as though gas were present, and mine officials are inclined to believe that possibly the air receiver was leaking, charging the air with an oil spray. All of the low-pressure machinery, skips, storage bins and headframe were totally destroyed, and the high-pressure compressors, traveling crane and steam hoist engine were badly damaged. Two electric hoists, operating skips, were not damaged, being located in an adjoining building protected by a brick wall.

Two men riding up the shaft on a cage, against mine regulations, were plunged to death by a drop of 2,300 ft. when the fire burned through a flat cable hoist rope leading to the steam hoist. The Ellison shaft, located on the south side of the gulch, is the main shaft of the mine workings. Pending the building of a new shafthouse, mining operations are being carried on through two old shafts located across the gulch near the mine's open-cut workings.

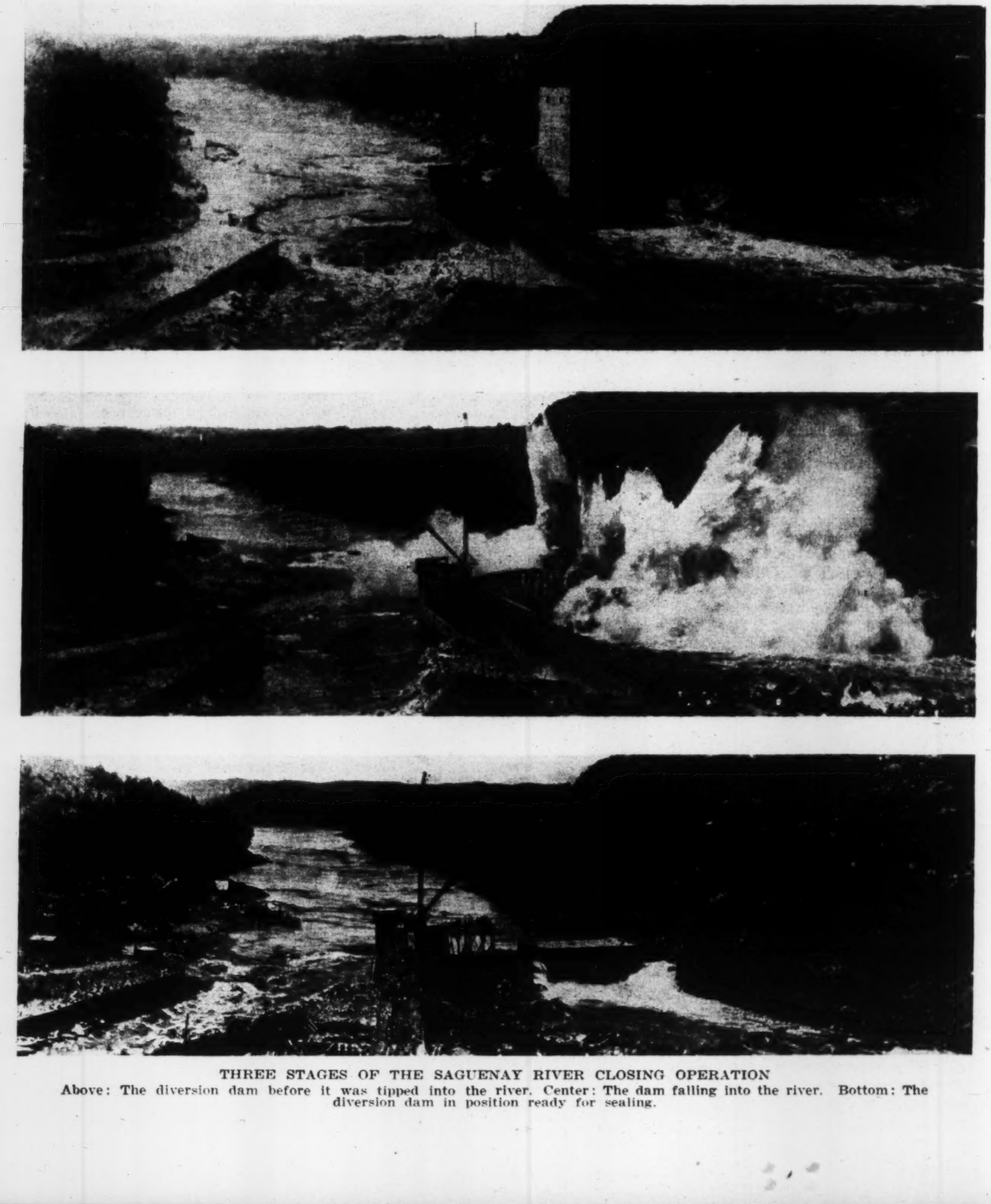
Saguenay River Diverted

Continued from p. 187

open. (The upper end of the diversion channel is at the left center in the accompanying illustrations.) When the time came to close the river diversion was accomplished by tipping into it a precast concrete dam, 92 ft. long by 45 ft. wide, containing 5,400 cu.yd. of concrete which had been built in a vertical position on an island in the river and balanced on two piers. The face toward the channel was contoured to fit the river bottom. The pier on the side toward the channel was blasted away and the precast dam rolled over the cylindrical part of the remaining pier and fell into place. The mass, weighing 11,000 tons, fell into thirty feet of swiftly moving water and came to rest within one inch of the calculated position. The water cushioned the fall so completely that the huge block of concrete settled gently into place without being broken. It fits the bottom closely and forms a very economical and satisfactory cofferdam. The work is being done by the Alcoa Power Co., under the direction of C. P. Dunn, chief engineer.

Dallas to Vote on City Manager Plan

A petition bearing about 9,000 names has been filed in Dallas, Tex., asking for submission to the voters of 30 amendments to the city charter, which if adopted would give the city the council-city manager form of government instead of the present commission form. If adopted, the amendments will become effective May 1, 1931, at the expiration of the terms of the present city officials and an elective council of nine members will elect a city manager.



THREE STAGES OF THE SAGUENAY RIVER CLOSING OPERATION

Above: The diversion dam before it was tipped into the river. Center: The dam falling into the river. Bottom: The diversion dam in position ready for sealing.

Substructure Bids In for Bucksport, Me., Bridge

Bids were received on July 29 for the substructure of the new state highway suspension bridge to be built over the Penobscot River at Bucksport, Me. The structure, to be known as the Waldo-Hancock bridge, is to have a main span of approximately 700 ft. Bids for the superstructure are called for elsewhere in this issue, to be sent to L. D. Barrows, chief engineer, state highway commission, Augusta, Me., by Aug. 26. The substructure bids, which cover main span piers, anchorages and approach bents and fill, are as follows:

Merritt-Chapman & Scott Corp., N. Y.	$282,711.50
L. E. Myers, N. Y.	329,976.50
Frederick Snare Corp., N. Y.	336,642.00
General Contracting Corp., Pittsburgh	348,918.00
Dravo Contracting Co., Pittsburgh	364,300.00
Cornell Contracting Co., N. Y.	392,515.00
Foundation Co., N. Y.	399,212.00
H. P. Converse, Co., Boston	432,435.55

The estimate of the engineers, Robinson & Steinman, New York, was $290,876.

Black Canyon Dam Surveys

Two contracts were made for mapping work in connection with construction of Boulder dam on the Colorado River. This fact was not made clear in the report of the survey work to be undertaken published in our issue of July 17, p. 115. Contract for the survey work at the dam site in Black Canyon has been awarded to the Aerotopograph Corp. of America, Washington, D. C., and for the townsite to Brock & Weymouth, of Philadelphia.

Hetch Hetchy Work Halted to Install Safety Equipment

As a direct result of the natural gas explosion which claimed twelve lives in the Hetch Hetchy Coast Range tunnel, work has been suspended in several of the headings until safety equipment can be installed to conform to all state and federal requirements. Of major importance among these demands will be the installation of twenty "permissive" electric locomotives to replace those previously used. The size of the tunnel may require the new units to be of special design, with the subsequent delay required to obtain governmental approval. In addition, approved electric cap-lamps will replace electric lights in the gas headings, and other safety and fire prevention measures will be adopted.

Orders to close down the work, issued by city engineer, M. M. O'Shaughnessy, with the approval of the city supervisors, places about 400 men out of work and may delay completion of the aqueduct line at least six months. The new requirements may require another $1,000,000 bond issue, it is reported, since the present funds have all been allocated to the work as previously planned. Recommendation of safety measures was made by C. H. Fry, of the state industrial accident commission, and S. H. Ash, of the Bureau of Mines.

Allen Hazen Dies While on Vacation in the West

Allen Hazen, one of the country's foremost authorities on hydraulics, water supply and sewage disposal, died on July 26 at Miles City, Mont. A week earlier, while traveling in the West with his daughter on pleasure and business, he suffered a heart attack on a train near Miles City and was taken from the train to the hospital at that point.

For more than 30 years Mr. Hazen had been a leader of thought in hydraulics and in sanitary engineering. Born in Vermont in 1869, he was graduated from the New Hampshire College of Agriculture and Mechanic Arts in 1886. Subsequently he became a special student in chemistry at Massachusetts Institute of Technology, where he came into contact with Dr. Drown, chief chemist of the Massachusetts state board of health, who, in 1888, put him in charge of the experiment station at Lawrence. In this work he was actively occupied with Boston sewage-disposal problems and those raised by severe typhoid epidemics in Lowell and Lawrence. While there, he made basic studies in filtration and in grading and selecting filter sands. In 1892 Asiatic cholera got into New York, and under the spur of the interest which it aroused in sanitation matters, Hiram F. Mills, under whose direction Mr. Hazen was working, built the water-filtration plant at Lawrence. This work was important in that it brought the germ theory of disease into prominence then, although it was recognized by only few physicians.

ALLEN HAZEN

Mr. Hazen's work at Lawrence brought to him an opportunity in 1893 to go to Chicago to take charge of the sewage-disposal plant at the World's Fair. The following year was spent in Europe to travel and study. During that time he wrote his first book, a review of European practice in water filtration.

Upon his return to this country Mr. Hazen went into private practice, first in partnership with Albert F. Noyes, of Boston. In 1897 Mr. Hazen came to New York and soon took charge of the design and construction of the filtration plant at Albany, N. Y. Again he attracted attention to his work in building the first slow sand filter plant with continuous filtration in the United States.

In 1904 Mr. Hazen went into partnership with George C. Whipple. Later, George W. Fuller, who had been a classmate of Mr. Hazen's in college, was a member of the firm for a time, and in more recent years Mr. Hazen had been associated in sanitary engineering work with Chester M. Everett, Leroy N. Babbitt and Malcolm Pirnie.

Mr. Hazen wrote a number of books on hydraulic and sanitary engineering subjects. It was he who introduced the probability concept into hydrology. His most recent work, a book on floodflow studies, has just been published.

Mr. Hazen had a wonderful gift for getting at the essentials of a problem. He was a concise speaker and a keen student whose interest in scientific facts never waned. For many years he had taken an active part in the affairs of the American Society of Civil Engineers.

President Appoints Commission on U. S.-Alaska Highway

To investigate the possibility of a highway from the United States to Alaska a special commission was appointed by President Hoover on July 28, as authorized by a Congressional appropriation of $10,000 for this purpose. The members are: Ernest Walker Sawyer, of California, executive assistant for Secretary Wilbur, who is now in Alaska working to promote the Interior Department plan of territorial development; Major Malcolm Elliott, Corps of Engineers, detailed for the past several years as highway commissioner in charge of road work in Alaska; and Herbert H. Rice, of Detroit, assistant to the president of General Motors and a member of the highway committee, National Automobile Chamber of Commerce. Mr. Rice has served on several delegations concerned with international highway problems.

This group will work with Canadian officials in working out a plan of development. The Alaskan highway project has been gathering widespread support and interest. During the past month Mr. Sawyer and Major Elliott were with a group of Americans and Canadians, including Premier Talmi, Governor Bruce and Governor Parks, of Alaska, going over part of the proposed route. Of the 2,000 miles of road necessary to connect Seattle with Fairbanks, 1,250 miles already are spanned, mostly through Canada, whose co-operation is essential to the project. Full details were given in *Engineering News-Record*, Aug. 22, 1929, p. 286.

Longview, Wash., to Have New Water System

The contract for the construction of a reservoir of 1,000,000-gal. capacity for the Washington Gas & Electric Co., Longview, Wash., has been awarded to Henry Niblett, contractor, of Longview. This reservoir, which is to be of reinforced concrete, 100x100 ft. square and 18 ft. deep, will cost about $18,000. It was designed by Stevens & Koon, consulting engineers, of Portland, Ore., as the first unit of a new water system for the city of Longview to take water from the Cowlitz River above West Kelso. The present water system is supplied from artesian wells and stored in two reservoirs of 500,000 gal. each. Present plans for the new system contemplate additional reservoirs and filter plants sufficient to accommodate a population of 50,000. Longview's present population is slightly over 10,000.

Bridge River Tunnel, in British Columbia, Completed

In the late afternoon of July 8 the 2½-mile tunnel, which is the first accomplishment in the construction of the British Columbia Electric Railway Co.'s hydro-electric development at Bridge River, was completed. Two and a half years have been spent in boring the tunnel, with an outlay of $1,750,000 in labor and material. The work was done by Pacific Engineers, Ltd., which had been awarded the contract.

The tunnel, 16 ft. in diameter, will carry water from Bridge River, 150 miles north of Vancouver, to the site of the power plant at Seton Lake, which is separated from the river by Mission Mountain and is at 1,200 ft. lower level. The first unit, which will develop 54,000 hp. and cost not less than $14,000,000, is expected to commence to deliver power by the end of 1932. The tunnel, however, is of sufficient size to provide for future installation totaling 216,000 hp., after which another tunnel will be bored to bring the capacity of the project to 500,000 hp.

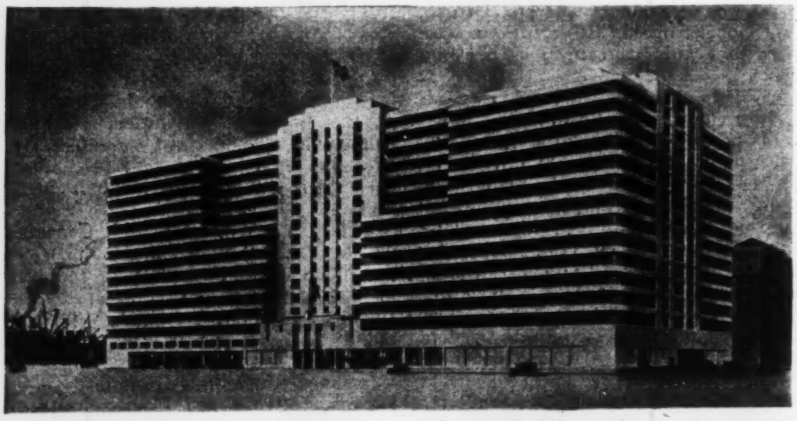
Denver to Start Construction on Eleven Mile Reservoir Dam

The Denver board of water commissioners is advertising for bids for the construction of the proposed Eleven Mile reservoir dam in Park County, 50 miles west of Colorado Springs at the mouth of a canyon of that name. The reservoir, which it is expected will be completed early in 1932, will hold approximately 80,000 acre-ft. of water, nearly doubling the supply available to Denver. About 50,000 cu.yd. of concrete must be placed by the contractors, and about 22,000 yd. of excavation will be necessary. D. D. Gross, chief engineer of the water board, estimates that the project will involve an outlay of more than $1,000,000.

Water Problems of U. S. and Mexico Subject of Study

The American section of the International Water Commission, which made a study of water problems as they affect the United States and Mexico, has submitted its report and has been formally dissolved. The commission consisted of Elwood Mead, Major-Gen. Lansing H. Beach and W. E. Anderson. L. M. Lawson, in addition to his duties as boundary commissioner, has been appointed water commissioner to continue the contact with Mexico growing out of the study. The report of the commission has not yet been made public.

NEW FREIGHT TERMINAL FOR NEW YORK CITY



This glass-belted $6,500,000 freight terminal, which, it is said, will be the largest structure of its kind ever erected, will be built on the west side in New York for the Lehigh Valley Railroad by Starrett Brothers & Eken, Inc., from plans by Russell G. Cory. The outer walls are carried on cantilever supports, jutting out from the inner columns, which are set back several feet from the outer walls to achieve the glass wall effect. The building will contain elevators 30x10 ft., capable of lifting the largest capacity trucks to the top, and will be made largely of reinforced concrete.

Contract for New Water-Works Plant for Hattiesburg, Miss.

A. H. Guion & Co., building contractors, of Gastonia, N. C., have been awarded the contract for the construction of a $200,000 unit of a new water-works plant for Hattiesburg, Miss. The Guion company bid includes the main filter plant of the water-works, the pumping station, aerators and a low-level pumping station.

The reservoir contract went to the Smith-Pugh Construction Co. for $78,890, and the pipe line contract to the Boltz Construction Co., of Memphis, for $146,000. With the completion of the new water-works plant, Hattiesburg, a city of 20,000, will have a plant with a capacity of approximately 6,000,000 gal.

New Water-Works System Planned for Calgary

Construction work on the new water-works system for Calgary, Alberta, the cost of which has been estimated at $3,770,000, is expected to begin by Aug. 1. The change of the system from the Bow River to the Elbow River involves the construction of a dam impounding 3,600,000,000 gal. of water. The entire project is expected to involve construction extending over a period of 2½ years, on the conclusion of which Calgary will have a supply of filtered water sufficient for a city of 200,000 people.

Height of Empire State Building Increased to 1,248 Ft.

Plans for a public observation gallery on top of the Empire State Building, at Fifth Ave. and 34th St., New York City, have been announced by the builders. The addition will extend the height of the building, with the Zeppelin mooring mast, to 1,248 ft. from the street level. Good progress is being made in the erection of the building and the framework now is complete to the 40th floor. Approximately one floor a day, five floors a week, are being added to the framework. The builders expect that the structure will be opened for occupancy by May 1, 1931.

Excavation Started for Diablo Power House

Excavation for the new city light power house at Diablo, on the Skagit River, will be started immediately by Rumsey & Jordan, contractors who recently completed the power tunnel for this project at a cost of $750,000. The excavation will be made on the cost-plus basis, the contractors to receive 12½ per cent profit. This method of payment has been decided upon because the engineering department has some doubt as to the exact amount of earth to be removed.

The same firm has also been awarded a contract to build the surge tank at the power tunnel at a cost of $64,000.

San Francisco-Oakland Bridge Route Selected by Board

Public hearings are being held in San Francisco this week to receive protests against the location for the San Francisco-Oakland bridge, tentatively selected July 24 by the San Francisco Bay bridge commission. The route adopted has its San Francisco terminus four blocks south of the foot of Market St. and crosses in four major spans to Goat Island, continuing from there by trestle and fill to Oakland. Selection of the location was based on engineering and traffic data prepared by the state division of highways and the railroad commission on the request of the board. Following the hearings this week it is planned to complete a final report in 60 days which will go to Governor Young and by him will be transmitted to President Hoover for final governmental approval. The San Francisco Bay bridge commission, appointed jointly by President Hoover and Governor Young, was announced in *Engineering News-Record*, Oct. 17, 1929, p. 633, and includes representatives of the army and navy in addition to local and state interests.

According to the plan now proposed, the four major spans will be 1,700 ft. long, with a clearance height of 221 ft. above low water. The three main supports in the navigation channel between San Francisco and Goat Island will consist of four separate interlocked piers forming a 200-ft. square. Two decks are planned, the upper one carrying six lanes of fast motor traffic, and the lower providing interurban and heavy trucking lanes. Depths to bedrock along the proposed route, indicated by recent borings, range from about 125 to 160 ft. below low water. Depths to bedrock along other proposed routes were found to be impracticable, which was a major consideration in determining the present location.

The proposed structure probably will be a state-owned toll bridge and, according to the recently enacted law, can be financed by bonds issued (without the necessity for popular approval) against revenues to be derived from bridge tolls. Extensive traffic studies have been made for the purpose of estimating revenue. Last year 4,500,000 automobiles were ferried across the bay in addition to a heavy interurban passenger traffic. It is estimated that the average saving in time for automobiles crossing on the bridges will be 26 minutes. Estimated cost of the structure is placed at $72,000,000, and no difficulty is expected in financing a project of this magnitude from toll revenues anticipated.

The Business Outlook

Business is running true to form in midsummer of a depression year. Industrial activity is at a low level, accentuated by shutdowns, vacations and a general marking time till the turn of the tide becomes evident. Building continues well sustained, somewhat beyond the point of seasonal decline, and the fair volume of contracts placed in the first half year will exert their force upon general business from now on. General trade has slackened considerably as the cumulative influence of six months of lowered purchasing power and depleted stocks begins to be felt. Our index of general business activity, falling from 96.4 to 93.4 per cent of normal this week, will probably decline further, but business sentiment has perceptibly freshened as the thermometer has dropped. Commodity prices are firmer.

—The Business Week, July 30.

Arkansas Lets Contracts for Roads and Bridges

Final contract awards on fifteen road and seven bridge jobs involving an expenditure of $1,170,210 have been made by the Arkansas highway commission. The work includes 133 miles of concrete and gravel highways, and approximately 5,000 ft. of bridges of various types, the seven projects calling for the construction of a total of 30 bridges.

WASHINGTON NOTES

By Paul Wooton

Washington Correspondent

Secretary of War to Inspect Mississippi Work by Airplane —River Barge Line Authorized

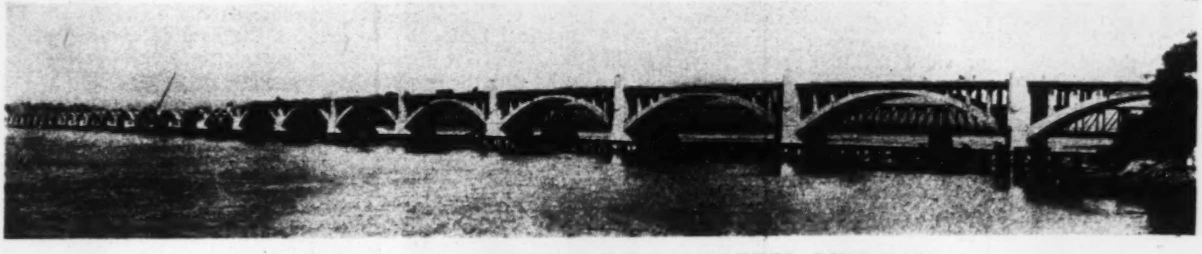
TO FAMILIARIZE himself with the local aspects of the flood-control situation, Secretary of War Hurley has announced his intention of making an aerial inspection trip to the scene of the work some time this summer. He plans to start in at New Orleans and fly up the river by easy stages. Before leaving New Orleans he will make a thorough inspection of conditions at Bonnet Carré. As secretary of war, Mr. Hurley is not only the chief executive officer in charge of the flood-control work but he also is the head of the Inland Waterways Corporation. Because of his interest in inland waterways he plans an immediate return to New Orleans from Minneapolis in a river towboat after his trip up the river by air.

Appointees to Power Commission May Act as Proxies

If the attorney-general decides that recess appointments may not be made under the amendment to the water-power act it is not unlikely that the three men nominated will be designated to represent the three secretaries in water-power matters. This would enable them to begin at once to familiarize themselves with their new duties and would remove the uncertainty that otherwise might delay the work of the commission.

Barge Line Authorized

The Mississippi Valley Barge Line Co. has been granted authority by the Interstate Commerce Commission to inaugurate barge line service between Cincinnati and New Orleans and intermediate ports under through joint rail-barge and rail-barge-rail routes and rates with the railroads based on a differential of 35c. on first class under the corresponding all-rail rates between



SUSQUEHANNA BRIDGE TO BE COMPLETED THIS FALL

All arch rings in the 7,374-ft. concrete arch bridge across the Susquehanna River between Columbia and Wrightsville, Pa., have been completed, and work is now progressing rapidly on the floor slabs in the expectation that the structure will be opened to traffic about Oct. 1, 1930. A 38-ft. roadway and 6-ft. sidewalk are carried across 28 arch spans and 20 approach spans. Concrete from central mixing plants at each end of the bridge is transported by an industrial railway over a temporary construction trestle. The bridge is being built by the Wiley-Maxon Construction Co., of Dayton, Ohio. It was designed by James B. Long, Norristown, Pa.

points in Central, Southern and Southwestern territories. For the present, the new line will serve only Cincinnati and New Orleans, operating a regular weekly service between the two ports for both high-grade and low-grade freight. The running time is estimated at six days southbound and from twelve to fourteen days northbound.

The company will use the public docks at New Orleans but is building a $530,000 river-rail terminal at Cincinnati to be completed by Aug. 1. Four steam towboats of 2,000 hp. each, with tunnel-type screw propulsion, and 50 barges, each of 300 tons capacity, are under construction. The line also has six 175-ton barges. The company has a fully subscribed capital stock of $3,000,000 and is planning to increase this by $500,000. About $1,500,000 has been paid in and the balance will be called as needed.

Illinois Waterway Work

Whether or not work on the Illinois waterway can proceed this summer still remains uncertain. Because no appropriations were made available in the legislation that authorized the federal government to take over the project, the War Department has asked the state authorities to advance part of their funds that are being held in reserve to pay for the construction of bridges across the completed waterway, the state to be reimbursed when appropriations are made by Congress.

The Secretary of War last week received a letter from Governor Emmerson, of Illinois, in which doubt is expressed that the state can advance its bridge money in view of the restrictive language of the state act pertaining to the expenditure of waterway funds. He believes, however, that the money can be used if the government enters into joint contracts with the state for continuing the work. The bridge reserve fund accumulated by the state amounts to $2,000,000.

Secretary Hurley is opposed to having the federal government become involved in any of the state contracts, but it is believed that a counter proposal will be made by the War Department so that the work can be started this summer. This proposal would concern the provision agreed to by the state that the Secretary of War could call upon the state officials to do any work that he specifies in connection with the waterway, provided the state has funds available in excess of the $2,000,000 bridge money. According to estimates, the state has more than $1,000,000 which has been raised for work on the waterway and which has not been obligated.

Freight Rates Raised in Mississippi Valley

Railroads in the Mississippi Valley have been authorized by the Interstate Commerce Commission to raise the level of freight rates on sand, gravel, crushed stone and related commodities to the scales prescribed for Southeastern territory in 1927. The carriers have been ordered to cancel proposed tariffs publishing rates exceeding the approved basis without prejudice to filing new schedules conforming to the commission's findings.

Southern Pacific Seeks Control of St. Louis Southwestern

The Southern Pacific has applied to the Interstate Commerce Commission for authority to acquire control of the St. Louis Southwestern, which, in the commission's consolidation plan, is assigned to the Illinois Central system. The Southern Pacific already has acquired a substantial interest in the Cotton Belt and in support of its application to acquire additional shares to obtain a majority states that the acquisition would be a step toward natural and logical unification, as the two systems have long maintained through routes in the South and Southwest. Increased competition with the Missouri Pacific system is cited as one of the advantages of the acquisition, the practical effect of which would be to extend the Cotton Belt's system further into the south and west and bring the Southern Pacific up to such important centers as St. Louis and Memphis. The Southern Pacific now owns 87,200 shares of preferred and 42,600 shares of Cotton Belt common. The application submitted to the Interstate Commerce Commission relates to the proposed purchase of 59,380 shares of preferred and 24,700 shares of common for $7,887,488.

Rear Admiral Rousseau Dies

Harry Harwood Rousseau, rear admiral, U. S. Navy, died of apoplexy on board the steamship "Cristobal" on July 24, while on his way to the Panama Canal Zone, where he had planned to make inspections as a director of the Panama Railroad. He was 60 years old.

Admiral Rousseau was born in Troy, N. Y., on April 19, 1870, and was graduated from the Rensselaer Polytechnic Institute in 1891. He first engaged in structural engineering work in New York and Pittsburgh and then entered the navy as a civil engineer in 1898. After four years in the bureau of yards and docks and four years at the navy yards, most of which time was spent at Mare Island, he was appointed by President Roosevelt in 1906 chief of the bureau of yards and docks with the temporary rank of rear admiral. After only three months in that post he was appointed a member of the Isthmian Canal Commission, and when the canal was completed continued to serve as engineer of terminal construction. In 1915 he was elevated from the rank of commander to rear admiral by Congress in recognition of his services on the canal.

After returning from Panama Admiral Rousseau was appointed a member of the commission on navy yards and naval stations and served on many other important boards and commissions. During the World War he was manager of the shipyards plant division of the Emergency Fleet Corporation. He was also in charge of plant extension work of the navy at many industrial establishments where naval funds were utilized. For the latter work he received the Navy Cross "for exceptionally meritorious service in a duty of great responsibility."

Society Calendar

AMERICAN IRON & STEEL INSTITUTE, New York City; semi-annual meeting, New York City, Oct. 24.

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York; fall meeting, St. Louis, Mo., Oct. 1-3.

AMERICAN WELDING SOCIETY, New York; fall meeting, Chicago, Sept. 22-27.

NATIONAL SAFETY CONGRESS, Chicago; annual meeting, Pittsburgh, Pa., Sept. 29-Oct. 3.

Personal Notes

C. M. Osborn, city manager of Shorewood, Wis., has resigned to accept appointment as city manager of Wilmette, Ill. Mr. Osborn started, as he is doing at Wilmette, the city-manager plan at East Cleveland, Ohio; Kenosha and Shorewood, Wis.

Clifford A. Betts, of the Betts Engineering Co., civil engineers, has been appointed as head of the streets and sewers department of Chattanooga, Tenn., to succeed Roger A. Crox, resigned.

Don M. Forester, formerly chief testing engineer for the Walter H. Flood & Co. laboratories at Jackson, Miss., has accepted a position as asphalt engineer with the Seabrook Engineering Corporation for work in Russia, and sailed for that country on July 24.

Leonard S. Doten, captain, Quartermaster Corps, U. S. Army, has been assigned to duty in Washington, D. C., where he will be in charge of the engineering and designing branches of the construction service, War Department.

Carl Wheat, of San Francisco, Calif., has been appointed chairman of a subcommittee of the statewide highway committee of the Califronia State Chamber of Commerce which will study the grade-crossings problem and submit recommendations to bring about a decrease in the number of accidents at grade crossings.

Obituary

John R. Coyle, engineer of the Dayton (Ohio) city planning commission, died on July 21 from injuries sustained in an automobile accident. He was 37 years old.

M. J. Coyne, of Irontown, Pa., died of pneumonia in Memphis, Tenn., on July 24. Mr. Coyne had just arrived in Memphis to accept a position as associate engineer in the government offices. He was 52 years old.

Construction Equipment and Materials

Manufacturers of Welded Wire Reinforcement Organize

For the benefit of engineers, architects, contractors and others seeking information on the use of welded wire reinforcing for concrete a number of manufacturers of this material have organized the Wire Reinforcement Institute, with headquarters in the National Press Building, Washington, D. C. The institute will function as a purely promotional organization for the assembly and dissemination of information, data and statistics. Its activities will be under the direction of Royall D. Bradbury, who has been instructor in structural design at the Massachusetts Institute of Technology, vice-president in charge of the welded fabric department of the Clinton Wire Cloth Co. and contract manager for the Aberthaw Construction Co.

New Developments

Control Switch Operated by Pressure Variation

A new single-pole pressure regulator, exceptionally small in size, has been announced by Cutler-Hammer, Inc., Milwaukee, Wis. This device can be used as a starting switch for motors up to 1 hp., 230 volts a.c. or d.c., or as a pilot switch in the control circuit of automatic starters for larger motors. The regulator closes the circuit at low pressure and opens the circuit at high pressure. It can be adjusted to operate at any pressure from 30 to 200 lb. To withstand moist atmospheres, the inclosing case is black japanned and metal working parts are cadmium plated. Double-break silver contacts prevent pitting and insure good contact. The diaphragm is of rubber. Conduit knockout holes in the case facilitate wiring.

Applications range over a wide field; the device can be used for maintaining pressure on systems containing water, air, gas and other similar fluids. For air compressor service, a small unloader device at the side of the case removes back pressure.

PRESSURE CONTROL SWITCH

Simple Tool Tightens Tie Wires

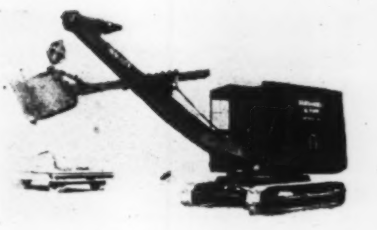
A simple tool similar to the ordinary carpenter's brace has been developed by the M & M Wire Clamp Co., Minneapolis, Minn., for rapidly twisting up the tie wires used in placing concrete reinforcement. Straight wire is used, which can be cut on the job. The device will easily tighten any gages of wire not heavier than No. 12. A material saving in laying concrete reinforcing is made possible by the use of the wire twister with heavy tie-wires, using a smaller number of ties and saving labor and material. The M & M wire twister is made of ½-in. cold-rolled steel with a hardwood handle. The 2-in. offset gives a powerful leverage.

WIRE TWISTER

Full-Revolving ½-Cu.Yd. Shovel

As a companion to its model K light, ⅜-cu.yd., full-revolving portable shovel, Bay City Shovels, Inc., Bay City, Mich., has announced the model K-2 ½-cu.yd. struck measure, full-revolving shovel of similar design, the principal difference between the machines being in the cubical contents of the bucket, the length of shovel boom and the working weight of the machines. The new model weighs 18 tons, compared with 14½ tons for the model K, and has an over-all width of 8 ft. 4 in., compared with 8 ft. for the lighter model. The over-all length has also been increased by 9 in. Identical features used on both machines include 8-in. center pin, 71-in. swing roller path, unit-cast car body and unit-cast machinery frame. Ball or roller bearings are used on all machine shafts, and steering and propelling clutches are located inside the cab, with no parts under the car body requiring attention or adjustment. Independent reversible clutches for each crawler allow sharp turns to be made by running the crawlers in opposite directions at the same time.

In addition to the shovel, the model K-2 is also available with clamshell, dragline, skimmer, trench hoe and crane attachments. As a shovel, it has an 18-ft. boom with 12½-ft. dipper stick and a chain type crowd. The ½-cu.yd. struck measure bucket is equipped with manganese front and reversible teeth.



½-CU.YD. SHOVEL

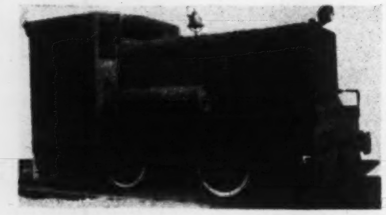
Tractor Built With Narrow Tread

For use in close quarters and on certain kinds of farm work, the Allis-Chalmers Mfg. Co., Milwaukee, Wis., has brought out a narrow-tread tractor with an outside width of only 47 in. and a short turning radius. This is an adaptation of the model U Allis-Chalmers (United) industrial tractor, with certain changes in design. Spring-mounted front axles are furnished when desired. Rear wheels are of standard diameter, but those in front have been made smaller to facilitate quick turning. A four-speed transmission is standard equipment, with speeds up to 20 m.p.h. in fourth gear.

NARROW-TREAD INDUSTRIAL TRACTOR

Gas-Electric Locomotives

The new line of gasoline-electric locomotives recently brought out by the Vulcan Iron Works, Wilkes-Barre, Pa., in both four-wheel and eight-wheel types in sizes from 10 to 80 tons, is typified by the 12-ton narrow-gage unit illustrated. This is powered with a 120-hp. Buda six-cylinder gasoline engine direct-connected to a 250-volt d.c. shunt-wound generator which furnishes current to two Westinghouse mine-haulage motors geared to the axles. Control is by means of two handles, one of which operates the electromagnetic switches, operates the engine throttle and regulates the generator field excitation and the starting, accelerating and speed of the locomotive. A separate reverser handle is provided for connecting the motors in series or parallel positions, and for reverse or forward operation. Movement of the speed handle from the "off"-



12-TON GAS-ELECTRIC LOCOMOTIVE

to the "pump" position speeds up the engine for operating the air compressor without running the locomotive.

Other construction features include standard Vulcan cast-steel bar-type frames; 30-in. steel-tired wheels; steel plate bumpers; cast-steel single-pocket couplers with spring draft gear; semi-elliptic springs, cross-equalized; four sand boxes; and Westinghouse air-brake equipment.

Under dynamometer tests this 12-ton unit developed a drawbar pull on a dry well-sanded rail of 8,000 lb. at a speed of about 3 m.p.h. Maximum speed is between 18 and 20 miles per hour.

New Publications

Engines — Bolinders oil engines of the two-cycle, low-pressure type in sizes from 6 to 600 hp. are described in a series of leaflets issued by **Bolinders Co., Inc.**, 33 Rector St., New York City. The engines are made in Sweden and are distributed through an American branch.

Pipe Coatings—In an elaborate and well-illustrated book of 72 pp. "The Protection of Oil and Gas Lines" the **Wailes Dove-Hermiston Corp.**, 17 Battery Place, New York City, discusses the necessity for pipe protection, the products available for this purpose and the methods used in application. Data are given on a number of important pipe lines protected with the products of the company.

Cork—Industrial applications of cork are discussed in great detail in a 48-p. illustrated booklet issued by the **Armstrong Cork Co.**, Lancaster, Pa.

Water Treatment—The Paradon chlorinizer, for the application of chlorine solution to small water supplies, swimming pools and sewage plants, is described in a 4-p. leaflet issued by the **Paradon Mfg. Co.**, Arlington, N. J.

Locomotive Cranes—Gasoline and diesel powered locomotive cranes ranging in capacity from 10 to 40 tons are described in bulletin 309 of the **Industrial Brownhoist Corp.**, Cleveland, Ohio.

Coloring Pigments—In bulletin 30, "The Art of Coloring Concrete," the **Geo. B. Smith Chemical Works, Inc.**, Springfield, Ill., gives recommendations as to the best procedure to use in coloring concrete.

Air Compressors—Catalog 83-R, describing the Sullivan line of portable gasoline-engine-driven compressors of two- and four-cylinder units ranging in capacity from 66 to 310 cu.ft., has been issued by the **Sullivan Machinery Co.**, Chicago, Ill.

Quick-Hardening Cement—Specifications and instructions for using and testing Quikard cement are given in a 16-p. illustrated booklet issued by the **Ash Grove Lime & Portland Cement Co.**, Kansas City, Mo.

Metal Lath—Bar-X-Lath, a new product combining diamond mesh lath with reinforcing rods, is described in a 4-p. folder issued by the **Consolidated Expanded Metal Companies**, Wheeling, W. Va.

Sheet Metal Products—Three illustrated catalogs of the **St. Paul Corrugating Co.**, St. Paul, Minn., deal with steel decking, skylights and ventilators, and corrugated metal culverts and well curbing.

Sewage Treatment — "Bleaching Powder as an Auxiliary Treatment of Sewage," an article by Herbert D. Bell, manager of the sewage-works at Barnsley, England, has been reprinted by **Innis, Speiden & Co.**, 117 Liberty St., New York City.

Drainage Gates—Reprints of two articles dealing with the use of automatic drainage gates are available from the **California Corrugated Culvert Co.**, West Berkeley, Calif. One of these deals with land drainage and protection in the Brazos Valley of Texas; the other with the remodeling of the sewage-treatment plant at Houston, Tex.

Conveyors—Engineering data on bucket elevators of all types, bin gates, track hoppers and feeders, steel apron and pan conveyors, weigh larries, screw conveyors and other types of bulk material handling equipment are given in catalog 202 of the **Chain Belt Co.**, Milwaukee, Wis.

Business Notes

Joy Manufacturing Co., Franklin, Pa., announces that it expects to enlarge its activities to cover handling of materials above ground as well as the continuance of its underground business, and therefore has appointed William H. Searight, for several years with the American Gas Accumulator Co. as Western manager, assistant sales manager in charge of snow loading and surface material handling development.

Vanadium Corporation of America, Chicago, Ill., has appointed C. B. Woodworth manager of the Western division, with headquarters in Chicago. He will be assisted by Walter Smith, who has been appointed assistant manager.

Independent Pneumatic Tool Co., Chicago, Ill., has opened a branch sales office in Los Angeles, Calif., in charge of Vernon Job, formerly manager of the San Francisco office. He will be assisted by B. J. Herron.

Paradon Mfg. Co., Arlington, N. J., has opened a new office in Pittsburgh, Pa., in charge of Ray S. Palmer.

Murex, Ltd., Rainham, Essex, England, has acquired Alloy Welding Processes, Ltd., of London. Murex, Ltd., also owns the Premier Electric Welding Co., Ltd., the works of which will shortly be combined with those of Alloy Welding Processes.

Foote Co., Inc., Nunda, N. Y., has appointed the G. F. Lowe Co., Chicago, Ill., as general distributor in a territory extending from western Michigan to Nebraska and from Kentucky to the Canadian border.

Costs and Contracts

E. N.-R. Index Numbers

Cost			Volume		
July 1,	**1930**	**200.95**	**June,**	**1930**	**324**
June 1,	1930	203.36	May,	1930	354
July 1,	1929	204.77	June,	1929	347
Average,	1929	207.02	Average,	1929	317
Average,	1928	206.78	Average,	1928	287
1913	......	100.00	1913	....	100

This Week's Contracts

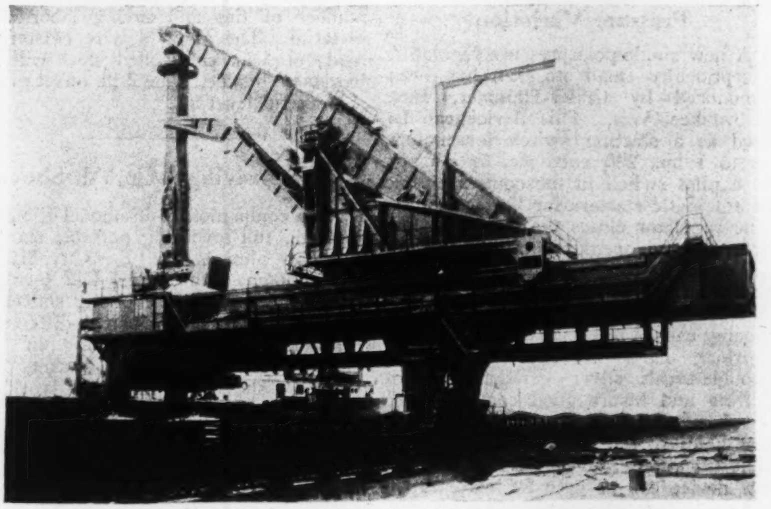
Heavy construction contracts, reported by *Engineering News-Record* in the week of July 31, with some comparisons, total as follows:

(In Thousands of Dollars)

	July 31, 1930	Average Last Four Weeks 1930	Average Last Four Weeks 1929
Buildings:			
Industrial	$ 6,390	$8,200	$7,700
Other	17,170	14,200	31,400
Streets and roads	14,677	16,350	18,000
Other eng. constr.	13,491	14,200	17,600
Total	$51,628	$52,970	$74,700

Total, all classes Jan. 1 to July 29:

1930	$2,117,032,000
1929	2,616,325,000



TRANSFERRING ORE FROM GREAT LAKES SHIPS TO RAILWAY CARS

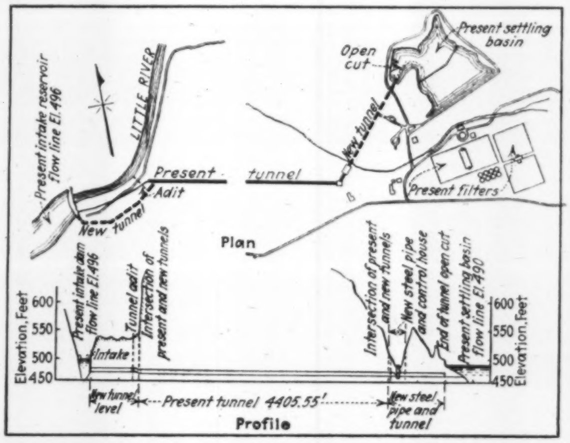
One of the three gigantic stiff-leg all-electric ore unloaders recently put into service at the new docks of the Chesapeake & Ohio Railway, Hocking division, at Presque Isle, Toledo, Ohio. Each movement of the dipper transfers 17 tons of ore from the ship's hold to a 50-ton disk hopper, from which it is carried in weighing lorry cars to railway cars on any of the four tracks beneath the unloader. The machine itself runs on two tracks 72½ ft. apart, consisting of a pair of rails on 24-in. centers. Each machine consists of two parts, a main frame with cantilever which traverses the dock, and a traveling trolley with bucket on top of the main frame. One trip every 50 seconds gives each of the three unloaders a capacity of 1,200 tons per hour. Operation is by electricity, there being a total of 1,060 hp. in the eight motors on each unloader. The machines were built by the Wellman Engineering Co., Cleveland, Ohio, with electrical equipment supplied by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Unit Prices From Current Construction Bids

Additional Intake Works for Springfield, Mass.

CONSTRUCTION of additional intake works for the Little River water supply for Springfield, Mass., consists of driving two rock tunnels 840 ft. and 730 ft. and connecting them to the present intake works between the dam on Little River and the filter plant at West Parish. Both tunnels are concrete lined and equivalent to a circle 6½ ft. in diameter. The site is in Westfield on property of the Springfield board of water commissioners.

The first of the new tunnels carries water from the intake reservoir to the present tunnel, connecting with it near the Little River end. At the other or outlet end of the present tunnel, the second new tunnel carries water to the upper end of the present coagulation basin. Control works will be built at the dam and an adit constructed near the junction with the present tunnel. Steel Venturi meters and gates, and foundations for a control house, will be built at the entrance to the second tunnel. The drawing shows the location of the work. Roads provide access both to the intake dam and to the outlet of the present tunnel, but any additional roads must be built by the contractor.


Present settling basin
Open cut
Present intake reservoir flow line El. 496
LITTLE RIVER
New tunnel
Present tunnel
Adit
Present filters
New tunnel
Plan
Elevation, Feet
600
550
500
450
Present intake dam flow line El. 496
Intake
Tunnel adit
Intersection of present and new tunnels
Intersection of present and new tunnels
New steel pipe and control house
End of tunnel open cut
Present settling basin flow line El. 490
New tunnel level
Present tunnel 4405.55'
New steel pipe and tunnel
Profile

GENERAL PLAN OF LITTLE RIVER WATER SUPPLY

Earth Excavation—Item 1 provides for excavation at the ends of the tunnels and adit and for placing steel pipe, Venturi meters and control-house foundations. Material not needed for fill may be placed in spoilbanks not more than 300 ft. away. After construction these structures are backfilled. This item also includes pumping, draining and sheeting, but where bracing and sheeting are left in, the lumber is paid for at $40 per 1,000 ft.

Rock Excavation—Item 2 is for rock in open cut for the tunnel portals, the adit portal, the control chamber and connections at the outlet of the present tunnel, and other rock excavation not in the tunnel. Item 3 is for removing tunnel rock. A complete ventilating system must be installed in each heading. Spoil is placed along the bank of Little River. The rock is believed to be mica schist, gneiss and other hard rock as shown by exposed ledges, and heavy timbering is not expected to be necessary. In the event that it is necessary, it will be paid for at $50 per 1,000 b.ft. of squared timbers.

Concrete—Item 4 covers tunnel lining, including adit, transition sections and junctions with the present tunnel. Item 5 covers backfill of concrete in trench around pipe. For item 4 and 6 the mix is 1 bbl. cement to 9 cu.ft. sand and 16 cu.ft. ballast, or 1.4 bbl. cement per cubic yard. For item 5, 1 bbl. to 111 cu.ft. and 16 cu.ft., or 1.2 bbl., cement per cubic yard. Rock excavated in the work may not be used, but stock from which to prepare both sand and gravel may be obtained from pits within a few miles of the site. The floor of the tunnel is placed first, leaving shoulders for the sides, which are placed next back of sectional forms which permit tamping and ramming. The roof is placed immediately after the sides.

Grouting—Item 7 is lump sum for filling spaces between lining and rock. Grout pipes (1½ in.) must be placed every 20 ft. along the top of the tunnel, 80 holes being required. Where less than a bag of cement is required per hole, neat cement mixed with water is used; for larger quantities, 1 part cement to 2 of sand. Grout is first applied to every fourth hole to 50-lb. pressure, and after 48 hours to the holes halfway between to 100 lb., and 48 hours later to the remaining holes to 150 lb.

Special Work—Item 11 is for connecting the new work to the old, which must be done without interrupting the supply of water to the purification works. In order to connect the new tunnels with the existing tunnel, the latter will be completely unwatered for periods of 32 hours each with sufficient time between to refill the coagulation basin.

Bidding—Five bids were received April 7, 1930, and contract was awarded on the lowest, which was $172,660 by Dravo Contracting Co., 310 Penn Ave., Pittsburgh. This bid was 18 per cent below the second and 20 per cent below the average of the five. The tabulation gives unit prices of the lowest two bidders; B is the West Construction Co., West Rutland, Mass. E. E. Lochridge is chief engineer of the board. Hazen & Everett, 25 West 43d St., New York, are consulting engineers.

		A		B	
1	5,000 cu.yd. earth excavation	$2.40	$12,000	$3.00	$15,000
2	2,000 cu.yd. rock (open cut)	5.50	11,000	6.00	12,000
3	3,700 cu.yd. rock (in tunnel)	18.80	69,560	25.50	94,350
4	1,500 cu.yd. concrete in tunnel	24.00	36,000	29.50	44,250
5	300 cu.yd. concrete for filling	12.00	3,600	12.00	3,600
6	500 cu.yd. all other concrete	20.00	10,000	27.50	13,750
7	grouting, lump sum	....	2,500	....	1,000
8	40,000 lb. steel reinforcement	.05	2,000	.05½	2,200
9	125,000 lb. steel pipe and venturi meters (lump sum)	....	15,000	....	20,000
10	60 tons placing c.i. pipe and gates (lump sum)	....	2,500	....	1,000
11	Special work, lump sum	....	4,000	....	1,500
12	appurtenances (lump sum)	....	4,500	....	2,500
	Totals		$172,660		$211,150

Test Borings in New York

THE New York board of water supply under contract 305 will have test borings made in the towns of North Castle, Mount Pleasant, Greenburg, and in Yonkers, Westchester County, on the line of the proposed tunnel between Kensico and Hill View reservoirs. There are four items: (1) land borings; (2) reservoir borings; (3) taking dry samples, and (4) casing left in place.

Methods to be used include both casing and diamond drilling. Six locations along the line of the proposed tunnel are largely in rock, with depths from 300 to 550 ft. Other borings, mostly between East View and Kensico reservoirs, will be 20 ft. into sound rock through an overburden of 150 ft. of glacial drift and other material. The reservoir borings will be done with floating equipment in water which may be 150 ft. deep and through overburden estimated at 120 ft.

Eight bids were received. The lowest (awarded contract May 20, 1930) was 43 per cent less than the second and 53.5 per cent below the average. The lowest two bids on each item were: (1) $2.74, $3; (2) $2.74, $4.90; (3) $0.40, $0.50; (4) $0.10, $0.10. The lowest three bidders on the whole work were: (A) Battle Bros.; (B) Sprague & Henwood, both of Scranton; (C) Osborne Drilling Co., New York; (D) Average of eight.

	A	B	C	D
8,000 lin.ft. land borings	$2.74	$4.90	$4.50	$4.958
3,500 lin.ft. reservoir borings	2.74	4.90	6.00	8.443
200 taking dry samples, each	.50	.50	.40	1.175
10,000 lb. casing left in place	.12	.10	.10	.124
Totals	$32,810	$57,450	$58,080	

Unit Prices From Current Construction Bids

Steel Bridge With Removable Center Span

SALEM County, N. J., will build a new bridge over the old Salem Canal, which connects the Delaware River a little below Wilmington with the headwaters of Salem River. The existing wood bridge is to be removed (Fig. 1). The plans call for a suspended 45-ft. span supported on two cantilever plate girders 62½ ft. long, as shown in Fig. 2. The plate girders are only 4 ft. 7 in. deep, thus requiring a smaller amount of concrete incasement than the usual economical design of girder and consequently a smaller dead load. Approach spans are another economy feature, as they eliminate wing-walls and abutment-loading with heavy earthfill, which has caused trouble on several bridges in south Jersey. Roadway over bridge and approaches will have a clear width of 30 ft.

The cantilever spans consist of deck plate girders extending 50 ft. from the bearings on the shore abutments to the pier bearings and continuing 12½ ft. to the bearings of the suspended span, the latter bearings being 45 ft. center to center. The floor system of the cantilever spans are of structural steel incased in concrete, as are the girders. The floor system of the suspended span also is steel but unincased, as are the girders.

All spans are decked with reinforced-concrete slabs, paved with asphalt blocks and fitted with deck drains and curb angles. On either side are 5-ft. sidewalks. Handrails on the suspended span are 2½-in. iron pipe and on the cantilever spans are reinforced concrete.

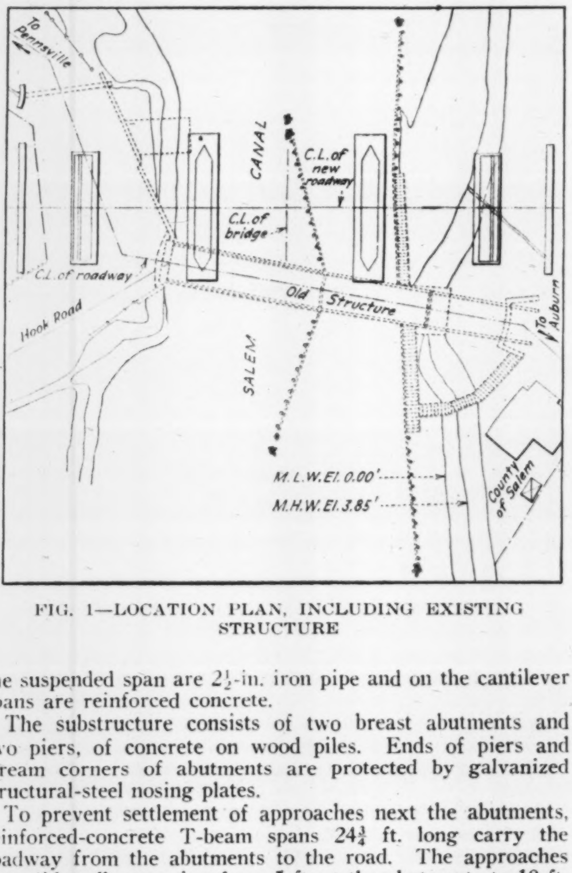


FIG. 1—LOCATION PLAN, INCLUDING EXISTING STRUCTURE

The substructure consists of two breast abutments and two piers, of concrete on wood piles. Ends of piers and stream corners of abutments are protected by galvanized structural-steel nosing plates.

To prevent settlement of approaches next the abutments, reinforced-concrete T-beam spans 24¾ ft. long carry the roadway from the abutments to the road. The approaches have sidewalks tapering from 5 ft. at the abutments to 10 ft. at the road end.

The existing bridge consists of an 80-ft. bobtailed swing-span resting on a pivot pier and a 65-ft. stationary approach span on pile bents spaced 13 ft. on centers. Abutments and pivot pier are stone masonry on timber grillages. The fender on the south side of the channel is of timber and wood piling and is 145 ft. long. That on the north side is of timber and piling and is 225 ft. This bridge is to be removed, including pivot pier, fenders and pile bents, down to streambed, and also such parts of the abutments and wing-walls as obstruct the site of the new bridge, as shown in Fig. 1.

History—The purpose of the Salem Canal as dug in 1870 was drainage and navigation. For many years the canal carried fertilizer and farm produce, now carried by motor trucks. Permit for the new fixed bridge was granted by the state board of commerce and navigation. The War Department disclaimed jurisdiction at the time, but has since assumed it. On May 14 the county awarded the contract pending a permit from the War Department, which was received June 6. Should navigation develop, machinery can be installed for lifting the center span.

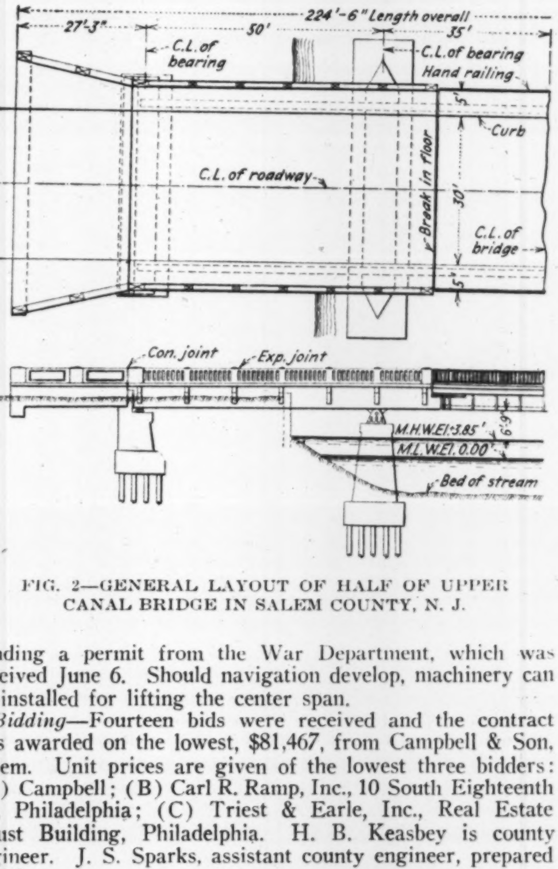


FIG. 2—GENERAL LAYOUT OF HALF OF UPPER CANAL BRIDGE IN SALEM COUNTY, N. J.

Bidding—Fourteen bids were received and the contract was awarded on the lowest, $81,467, from Campbell & Son, Salem. Unit prices are given of the lowest three bidders: (A) Campbell; (B) Carl R. Ramp, Inc., 10 South Eighteenth St., Philadelphia; (C) Triest & Earle, Inc., Real Estate Trust Building, Philadelphia. H. B. Keasbey is county engineer. J. S. Sparks, assistant county engineer, prepared the plans.

NEW STEEL BRIDGE AT SALEM, N. J.

	A	B	C
417 cu.yd. pier excav	$20.00	$14.00	$10.00
630 cu.yd. abutment excav	5.00	4.20	1.00
6,240 lin.ft. bearing piles	.70	.60	.60
443 cu.yd. conc.—Class D	15.00	13.55	12.00
705 cu.yd. conc.—Class C	16.00	15.25	15.00
617 cu.yd. conc.—Class B	17.00	22.45	25.00
495,415 lb. structural steel	.04	.046	.05
109,953 lb. reinforcing steel	.045	.0425	.05
39,400 lb. castings	.0935	.103	.12
1,780 lb. forged pins	.1985	.218	.20
425 lb. bronze bearings	.5785	.6325	.60
6,408 sq.ft. fabric waterproofing	.16	.25	.20
712 sq.yd. asphalt block paving	4.50	4.40	5.00
12 cast-iron pipe deck drain	14.00	18.40	20.00
12 wrought-iron pipe deck drain	.50	1.00	1.00
443 lin.ft. black iron forms	.28	.45	.30
2,130 lin.ft. standard metal caging	.08	.10	.10
94 lin.ft. ornamental hand railing	5.00	6.70	6.00
256 lin.ft. std. conc. hand railing	5.00	4.80	4.00
101 lin.ft. conc. balustrade	4.00	5.35	6.00
287 sq.ft. copper sheeting	.16	.45	.40
Removal of existing structure	1,250.00	1,900.00	3,200.00
Totals	$81,467	$84,819	$86,416

CONSTRUCTION NEWS

Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue.

Location	Project	Cost	Status
Water works			
Denver	Reservoir	$1,000,000	Bids asked
Hamilton (Ont.)	Filtration Plant	1,000,000	Bids asked
Montreal	Mains	1,000,000	Proposed
Bridges			
New York and New Jersey	Bridge and tunnel	2,513,624	Contract
E. D. I. L.			
Mercedes (Tex.)	Irrigation work, etc	1,500,000	Proposed
Unclassified			
Okla., Iowa, Illinois, Minn., Nebr. and Wisc	Pipe lines	12,000,000	Proposed
Ft. Williams (Ont.)	Gas and coking plant	1,000,000	Proposed
Factories and Mills			
New York	Factory	4,000,000	Contracts
Cleveland	Rolling mill	5,000,000	Proposed
Shops and Foundries			
Pittsburgh	Machine shop	1,500,000	Bids asked
Buildings			
Kansas City (Mo.)	Bank	3,000,000	Contract
Nashville	College	1,000,000	Proposed
Petersburg (Va.)	College	1,000,000	Proposed
Toronto (Ont.)	College	2,000,000	Proposed
Chicago	High school	1,500,000	Proposed
Cleveland	Hospitals	2,825,000	Proposed
Asbury Park	Hospitals	1,100,000	Contract
Springfield (Mass.)	Hospital	1,000,000	Bids asked
Toledo	Museum	2,000,000	Contract
Enid (Okla.)	Office	1,000,000	Proposed
Columbus (O.)	Office	3,097,000	Bids asked
Dallas	Office	1,500,000	Contract
Los Angeles	Office	1,000,000	Bids asked
Hollybrook (Va.)	Orphanage	1,000,000	Bids asked
New York	Storage and service station	1,500,000	Proposed
Cleveland	Store	10,000,000	Proposed
Portland (Ore.)	Store	2,000,000	Contract
Newark (N. J.)	Theatre	1,000,000	Bids ask

WATERWORKS

PROPOSED WORK

Calif., Santa Ana—Carpenter Water Co., El Modena, Irvine Water Co. and Serrano Water Co., Villa Park, surveys dam in Santiago Canyon. $750,000. A. Kempkey, Hobart Bldg., San Francisco, engr.

Ill., Nashville—Preliminary plans complete waterworks, distribution systems. Election soon $140,000 bonds for same. Russell & Axon, McDaniels Bldg., Springfield, and 6200 Easton Ave., St. Louis, Mo., engrs.

Mich., Detroit—Auditors Wayne Co. retained P. W. Keating, engr., 1052 Hubbard Ave., to prepare plans extending 8- to 12-in. mains from here, to House of Correction site west of Northville. $80,000.

Okla., Yukon — Preliminary plans water softening plant. $20,000. C. A. Wood, Perrine Bldg., Oklahoma City, engr.

Pa., South Greensburg—Westmoreland Water Co. brick filtration and storage building. D. C. Morrow, c/o owner, Washington, engr.

Tenn., Johnson City—Soon takes bids 1 m.g. steel tank to be used for water reservoir. $15,000. Plans later rebuilding present 2,200,000 gal. reservoir. W. B. Ellison, mayor.

Tex., Mineola—City, c/o J. Russell, improving waterworks, sewers. $20,000.

Que., Montreal—For 13,200 ft. two 36 in. mains from new McTavish pumping station to Cote des Neiges reservoir and Notre Dame de Grace. $1,000,000.

BIDS ASKED

Calif., Cloverdale—Aug. 5, by City Trustees, 12,080 lin.ft. 4 in., 2,155 lin.ft. 2 in., 3,735 lin.ft. 4 in. or 3,735 lin.ft. 2 in. c.i. pipe miscellaneous fittings. A. M. Jensen, 68 Post St., San Francisco, engr.

Colo., Denver—Aug. 12, by Bd. Water Comrs., 1509 Cleveland Pl., Eleven Mile Canon Reservoir, incl. 50,000 cu.yd. concrete, 22,000 cu.yd. excav. $1,000,000. D. D. Gross, 902 South Race St., ch. engr. Bd.

Mich., Detroit — Aug. 5, by Secretary Bd. Water Comrs. fabricating, erecting 2 m.g. steel water tank, tower on foundations. G. H. Fenkell, 735 Randolph St., genl. mgr.

Miss., Bay Springs—Aug. 4, by Bd. Supervs. Jasper Co., 700 ft. bridge over Tallahalla Creek, near Foulka.

N. J., Jersey City — Aug. 5, by Bd. City Comrs., City Hall, c.i. water pipe, special and standard castings, iron body bronze mounted double hub valves, fire hydrants, soft blue pig lead to Bureau Water. $15,000. J. Henderson, city engr.

N. Y., Mayfield — Aug. 15, by Bd. Village Trustees & Water Comrs., Fire Dpt. Bldg., water supply system, incl. pumping station, equipment, embankment, roadway. Solomon & Keis, and H. E. Gabriels, 257 Bway., Troy, engrs.; adv. E. N.-R. July 31.

Okla., Crescent—Mayor and City Council in market one 70 g.p.m. triplex pump, one 350 g.p.m. centrifugal pump, one 30 hp. and one 10 hp. motors. J. Favor, supt. Water Dpt.

R. I., Warwick—Aug. 1, by Bd. Water Supply, Town Hall, Apponaug, 1 story, brick, concrete booster pumping station, incl. one 50-hp. centrifugal pump with electric motor and one with gasoline engine, control equipment, piping. Fay, Spofford & Thorndike, 44 School St., Boston, Mass., engrs.

Ont., Hamilton—City Council bids about Oct. 30, new waterworks filtration plant. $1,000,000. W. L. McFaul, city engr. Noted May 1.

CONTRACTS AWARDED

Calif., Eureka—Bd. P. Wks., J. Griffith, supt., to Amer. Cast Iron Pipe Co., Balboa Bldg., San Francisco, furnishing, delivering c.i. pipe, 5,000 ft. 8 in. at $4,185, 2,000 ft. 6 in. $1,152, 3,000 ft. 4 in. $1,164. Noted July 10.

Calif., Manhattan Beach—To Pacific States Cast Iron Co., Subway Terminal Bldg., Los Angeles, 3,000 ft. 4, 6 and 8 in. c.i. pipe, $2,406; to Reliable Iron Fdry. Co., 1611 Fishburn St., Los Angeles, fittings for same, $153; to Crane Co., 321 East 3rd St., Los Angeles, fire hydrants $147, lead $225.20, oakum $13.47.

Colo., Meeker—New waterworks, to J. F. Potts, Loveland, $80,000. Noted June 12.

Conn., Bridgeport—Bridgeport Hydraulic Co. 820 Main St., S. Senior, pres., extending water works to Long Hill and Short Beach, $80,000. Owner builds. Private plans. Noted July 24.

Conn., Putnam—Water Comrs., 100,696 ft. 6- to 16-in. mains, to Joseph Long & Son, Leominster, Mass. Est. $75,000.

Conn., Simsbury—Simsbury Water Co., concrete brick filtration plant, to Wise & Upson, 7 Forest St., Hartford. Est. exceeds $15,000.

Florida—See "Streets and Roads."

Idaho, Weiser—For 1½ m.g. filtration plant, to Reader & Lowe, Weiser, $47,153; filtration equipment, to McFarlane Eng. Co., Portland, Ore., $9,282; pumping equipment, to De Laval Steam Turbine Co., 514 4th Ave., Seattle, Wash., $3,565. Grand total $60,000. Noted Apr. 3.

Ill., Effingham—See "Dams."

Mass., Gloucester — Water tower tanks for waterworks, to Chicago Bridge Co., 37 West Van Buren St., Chicago, Ill. Est. exceeds $15,000.

Mass., Revere (br. Boston)—Commonwealth of Massachusetts, Metropolitan Dist. Comn., 1 Ashburton Pl., Boston, 5,306 lin.ft. 24 in. c.i. water pipe, to J. Williams, 8 Beechwood St., Dorchester, $20,088.

Mass., Southboro—G. A. Mooney, Bd. Water Comn., water supply, to Mogavero & Son, 6 Dane St., Peabody, $57,000.

Mich., Detroit—Fire Dpt., West Larned St., five hundred 6 in. double nozzle standard fire hydrants and 500 double disc standard gate valves, to Michigan Valve & Fdry. Co., Clayton and Parkinson Sts., $34,740.

N. Y., Brooklyn—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., mains in Avenue Z, to George V. Cornell Constr. Co., Grand Central Terminal, New York, $11,725. Noted July 10.

N. Y., New York—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., mains in Riverside Dr. W and Viaduct, to J. V. Timoney Constr. Co., 256 Bway., $8,000. Noted July 10.

N. Y., St. George—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Anderson Ave., to Knidem Constr. Co., 4197 Park Ave., New York, $20,680. Noted July 3.

N. Y., Syracuse—Bd. Contr. & Supply, lining new reservoir, to I. M. Luddington Sons, 215 Powers Bldg., Rochester, $271,258. Noted July 10.

Ore., Eugene—Stevens & Koon, engrs., Spaulding Bldg., Portland, 1,400 hp. Erie boiler, to Gordon & Finkbeiner, 224 Pine St., Portland, $56,892; 6,000 kw. turbo-generator, to General Electric Co., Electric Bldg., Portland, $219,000.

B. C., Vancouver—For 30,000 ft. 6 in. c.i. pipe, to Evans Coleman & Evans Ltd., foot of Columbia Ave., $20,450.

Ont., Niagara Falls—S. E. Goddard, city mgr., filtration plant, pumping station, to Robertson Constr. Co., Imperial Bank Chambers, $266,472. Noted July 11 Daily.

SEWERS

PROPOSED WORK

Ariz., Florence—Preliminary plans sewerage system, incl. 74 manholes, 20 junction chambers, 17 flush tanks, 111 manhole covers and frames, 38,115 ft. 6- to 15-in. vitr. tile pipe, 19,256 cu.yd. excav., 1,041 yd. branches. D. C. Scott, Phoenix, engr.

Calif., Newport Beach—Sewerage system in Newport Heights. $40,000. R. L. Patterson, city engr.

Ill., Lombard — Sanitary sewers, disposal plant, auxiliary piping. $250,000. W. J. Joyce, village clk.

Ill., Nashville—Preliminary plans sanitary sewers, disposal plant. Election soon $140,000 bonds for same. Russell & Axon, McDaniel Bldg., Springfield, and 6200 Easton Ave., St. Louis, Mo., engrs.

Ind., Indianapolis—Bd. Wks. 10 in. vitr. clay or sanitary sewers in Dearborn St. $25,000, Chester Ave. $26,000, Grant Ave. $25,100; 10 and 12 in. vitr. clay or concrete sewers in Wallace Ave. $26,400, Euclid Ave. $25,000. A. H. Moore, Indianapolis, engr.

Ind., Kokomo—Bd. P. Wks. local sewer in Calumet and Virginia Sts. $26,000. O. Tobias, Kokomo, city clk.

Ind., Marion—Sanitary sewers in 2nd and 3rd Sts. $27,000. R. E. Norman, city clk.

Ia., Carroll — Sewage disposal plant. To exceed $25,000. Burns & McDonnell Eng. Co., 406 Interstate Bldg., Kansas City, Mo., engrs.

See proposal advertising on page 95

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Sewers (Continued)

N. J., Newton—Town Comrs., Town Hall, revised plans and new bids probably about Aug. 15, reconstructing sewage disposal plant. $100,000. Noted June 4.

N. J., Spring Lake—Bd. Boro Council, Boro Hall, rebuilding sewage disposal plant, incl. new equipment, new intercepting sewer in Ocean Ave. $150,000. G. Roland Moore, 603 Mattison Ave., Asbury Park, engr. Noted July 3.

O., Elyria — City. 3 sewage ejector plants. $150,000. G. B. Gascoigne, Leader Bldg., Cleveland, engr.

Okla., Mountain Park — Sanitary sewers. $25,000.

BIDS ASKED

Calif., Los Angeles—Aug. 6, by Bd. P. Wks., Sect. 32-B-North Outfall Sewer, incl. 850 ft. 10- to 24-in. vitr. sewer, 320 ft. double barrel 10 in. and 1,258 ft. 10 in. centrifugally c.i. mains, 34 ft. rein.-con. pumping plant, rein.-con. force main.

Mass., Boston—Aug. 4, by Dpt. P. Wks., J. A. Rourke, comr., City Hall, sewerage works in various streets in West Roxbury; Aug. 5, in East Boston. $25,000.

Mass., Boston—Aug. 6, by Dpt. P. Wks., J. A. Rourke, comr., City Hall, sewerage works in Dorchester. $25,000.

Mass., Marblehead—Aug. 1, by City and F. A. Barbour, engr., Tremont Bldg., Boston, sewers, incl. c.i. pipe, 55 manholes, 60 steps, various streets. $25,000.

N. J., Montvale—Aug. 4, by Village, water distribution system. T. F. Bowe, 110 William St., New York, consult. engr.

N. Y., New York—Aug. 5, by J. Miller, pres. Manhattan Boro, Municipal Bldg., storm relief sewer in West 14th St. from 10th Ave. to Hudson River, incl. storm overflow at 10th Ave. and West 14th St.

N. Y., St. George—Aug. 6, by J. A. Lynch, pres. Richmond Boro, Boro Hall, sanitary sewer in Grandview Terrace and Davis Ave.

Pa., Phila.—Aug. 6, by Dpt. P. Wks., Bureau Eng. & Surveys, A. Murdock, dir., City Hall Annex, Schedule A—branch sewers in 18 streets and avenues; Schedule B—main sewers in 4 streets; Schedule C—sewage disposal project, dredging in Frankford Creek.

Pa., Springdale—Aug. 7, by H. J. Barnes, boro secy., 800 ft. 36 and 48 in. storm sewers in Colfax and Grant Sts. J. M. Sage, Cheswick, engr.

Ont., Ottawa—J. Gamble, clk. Nepean and Westboro Twps. taking bids sewers $12,680, watermains $6,320.

CONTRACTS AWARDED

Calif., Los Angeles—Los Angeles Co., Vernon Extension Trunk Sewer, (Co. Sanitary Dist. 1), incl. 7,346 ft. 24 in. and 1,305 ft. 18 in. vitr. sewer with standard and special concrete bed, 23 standard manholes, junction chambers, to M. T. Markovich, 1205 Stanley Ave., Long Beach, $30,015.

Calif., Los Angeles—Bd. P. Wks., City Hall, Jefferson Storm Drain System, Sect. 3, to C. H. Johnston, 947 North Orange Dr., $334,136.

Calif., San Francisco — Bd. Trustees Islais Creek Reclamation Dist. 375, City Hall, wooden box drains on Islais Creek Channel, to M. B. McGowan, Call Bldg., $120,568.

Conn., Meriden — Sewers, appurtenances in Highland and Meriden Aves., to J. Angelone, Summit St., Southington. Est. $25,000.

Conn., Torrington—Town, concrete, brick, steel sewage disposal plant, to J. DeMichael & Bro., 58 High St., $67,305. Est. $70,000.

Ind., Chestertown—Bd. City Trustees, Main Trunk Sewer, to General Dredging Co., 3589 West Paylor St., Ft. Wayne, $104,600. Est. $153,843. Noted June 19.

Ind., Evansville—Auburn Sewer, incl. 9,268 ft. 8- to 36-in. vitr. clay pipe, to J. R. Palmer, Danville, Ill., $25,275.

Ky., Louisville—Commissioners of Sewerage, M. E. Taylor Bldg., 5,600 lin.ft. 24 in. vitr. sewer, in concrete cradle, 3 c.i. inverted syphons with inlet, outlet and cleanout chambers, manholes, in Cherokee Park, to J. J. Quinn Co., Bedford, Ind. Noted Apr. 17.

Me., Portland—For 3,091 lin.ft. 8- to 42-in. pipe and brick sewer in Mackworth St. and Ocean Ave., to F. A. Rumery Co., 533 Forest St., $27,983.

Md., Baltimore — Mayor and City Council, storm and sanitary sewers in Storm Water Contr. 58, to Aiello Constr. Co., Gough and Dean Sts., $144,402.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., sewerage works in Dale St., West Roxbury, to J. J. Coughlan & Sons, 27 School St., Boston, $32,301.

Minn., Spring Grove—A. A. Thompson, village clk., 15,100 ft. 8- to 12-in. sanitary sewers, disposal plant, incl. Imhoff tank, in Sewer Project 1, also Lateral Sewer 1, Dist. 1, to E. L. Royer, Valley Junction, Wis., $35,991. Est. $25,000. Noted July 3.

Mich., Detroit—Dpt. P. Wks., to A. Rossi, 516 Transportation Bldg., brick sewers with brick, concrete manholes in Frisbee Ave. Sewer west of Rouge River, $101,588, Connors Arm Sewer north of Sirron in Connors Ave. $79,000; Berg Road Sewer, Sect. 4, north of Pembroke Ave. $41,717; to Jos. Rossi & Sons, Inc., 399 Whittier Ave., Seven Mile Road Sewer, Sect. 1, west of Rouge River, $183,567. Grand total $405,872. Noted July 3.

Okla., Tulsa — Cat Creek Relief Sewer, to Fike & Frye, 2531 East Independence St., $25,690. Est. $27,000.

Pa., Phila.—Dpt. P. Wks., Bureau Eng. & Surveys, A. Murdock, dir., to P. De Sipio & D. Vallome, 28th and Wolf Sts., branch sewers in Belgrade St. $2,976, Bigler St. $15,825; to I. M. Durkin, Ashton and Grant Sts., C St. $3,471, Howard St. $4,543; to J. J. McHugh, 1617 Race St., Chew St. $4,523, Marvine St. $3,466; sewage disposal project interception Whitaker Ave. and Ruscomb St., sewers at Tacony Creek, $6,251; to A. Franzi, 513 High St., Conlyn St. $4,414, Musgrave St. $3,425, Narragansett St. $1,000; to R. Divito, 6314 Dicks Ave. Pechin St. $16,070, to P. Pincietti, 4003 Roosevelt Blvd., Thouron St. $16,715, Duncannon Ave., Howard and Hope Sts. $10,052; to E. Vantresco, 6016 Ross St., Maris St. $6,485; to Corrodo & Froseline, 6045 Magnolia Ave., 16th St., $1,786; to V. Neamand, 628 Leavick Blvd., Unruh St., $1,363; to V. Jaffolla, Penna Bldg., main sewer in Horrocks St., $64,208; to M. & J. B. McHugh, 892 North Markoe St., bridge on line of B St., under connecting railway, $139,932. Grand total $306,505.

Pa., Phila.—See "Streets and Roads."

Wash., Seattle—Bd. P. Wks., trunk sewer in Lakeside St., et al., to Queen City Constr. Co., 1411 4th Avenue Bldg., $159,570.

Wis., Milwaukee — Metropolitan Sewerage Comn., sub-structure and superstructure for Richards Road Sewage Booster Station, to Wenzel & Henoch, 5025 State St., Milwaukee, $34,300.

BRIDGES

PROPOSED WORK

Calif., Oakdale — Stanislaus Co. (Modesto) surveys steel bridge over Stanislaus River. $60,000. J. H. Hoskins, Modesto, co. surv.

Ind., Evansville—Bd. Comrs. Vanderburg Co. West Franklin St. Bridge. $185,000. A. Meisinger, Evansville, engr.

Ind., Michigan City—Bd. Comrs. Laporte Co., Laporte, rein.-con. bridge, at Franklin St. $200,000 appropriated. Scherzer Co., 50 West Jackson Blvd., Chicago, Ill., engrs.

Kan., Leavenworth—City, Atchison, Topeka & Santa Fe R.R. Co., 80 East Jackson Blvd., Chicago, Ill., G. W. Harris, ch. engr., and Chicago, Burlington & Quincy R.R. 547 West Jackson Blvd., Chicago, Ill., A. W. Newton, ch. engr., soon take bids 122 ft. rein.-con. viaduct, 24 ft. roadway, 6 ft. sidewalks, Pennsylvania Ave. $35,000.

Minn., Henderson — State Hy. Comn., St. Paul, concrete bridge over Minnesota River, on State Trunk Hy. 14. $50,000.

N. Y., Nelliston—State, Albany, reconstructing bridge over Barge Canal. $140,000.

O., Cleveland—Comrs. Cuyahoga Co., preliminary plans rein.-con. bridge on Triskett Rd. $150,000. A. M. Felgate, Court House, engr.

O., Cleveland — Comrs. Cuyahoga Co., preliminary plans rein.-con. bridge, on Wolff Rd. $60,000. A. M. Felgate, Court House, engr.

Oklahoma—State Hy. Dpt., Oklahoma City, preliminary plans 9 span 120 ft. rein.-con. bridge on U. S. Hy. 64, near Buffalo, Harper Co., $40,000; 1 span 108 ft. steel truss bridge on concrete piers at Center, Pontotoc Co., $30,000. A. R. Losh, hy. engr.

Pa., Kittanning—Comrs. Armstrong Co. soon take bids bridge over Allegheny River, at Market St. $800,000. J. Farris, Empire Bldg., Pittsburgh, engr.

BIDS ASKED

California—Aug. 13, by C. H. Purcell, ch. engr. State Hy. Comn., Sacramento, two 67 ft. 7 in. through plate girder spans and one 40 ft. steel beam span, and 450 ft. timber trestle approach over Northwestern Pacific R.R., near Beatrice, Humboldt Co.; seven 57 ft. span rein.-con. girder bridge on concrete piers with pile foundations over San Gabriel River, near Seal Beach, Los Angeles Co.

Kentucky—Sept. 5, by State Hy. Dpt., Frankfort, rein.-con. substructure, two 50 ft. deck girder approach spans for bridge over Craigs Creek, on Warsaw-Carrollton Rd., F. A. P. 198-A B and 140 ft. steel superstructure, Sect. A B 2, Gallatin Co.—rein.-con. substructure, approaches for bridge over Kinniconick Creek, on Vanceburg-Fullerton Rd., S. P. 106-A B and superstructure two 110 ft. and one 164 ft. steel span bridge with concrete flooring, Sect. 2, Lewis Co.—rein.-con. substructure, four 50 ft. rein.-con. approach spans, approach fills for bridge at West Liberty, also grading 1 mi. approaches to same, F. A. P. 120-E G and 140 ft. steel span bridge over Licking River at West Liberty, F. A. P. 120-E B Morgan Co.—approaches, rein.-con. substructure for bridge over Kentucky River at Chavies, F. R. 64-B B, and three 70 ft. and one 126 ft. steel superstructure with concrete flooring F. R. 64-B B 2, Perry Co. B. Johnson, chn.

Me., Bucksport—Aug. 26, by Directors Waldo-Hancock Bridge, L. D. Barrows, secy., c/o Chief Engineer State Hy. Comn., Augusta, superstructure for Waldo-Hancock Bridge, near here. Robinson & Steinman, 117 Liberty St., New York, consult. engrs.; adv. E. N.-R. July 31. Noted July 3.

Md., Lanham—Aug. 7, by State Roads Comn., Baltimore, substructure for 101 ft. span bridge over Pennsylvania R.R., Contr. P-119-33, Prince Georges Co. G. C. Uhl, chn.; adv. E. N.-R. July 31.

Massachusetts — Aug. 5, by Commonwealth of Massachusetts, State House, Boston, repairing 31 timber bridges over Southern New England R.R. between and including Brimfield and Blackstone. A. W. Dean, c/o Dpt. P. Wks., Boston, engr.

Miss., Fayette—Aug. 4, by Bd. Supervs. Jefferson Co., 8 bridges on Blue Hill-Pleasant Hill Rd., incl. 38,914 ft. creosoted lumber, 1,250 lin.ft. creosoted piling.

Miss., Natchez — Aug. 5, by Bd. Supervs. Adams Co., reconstructing and 2 additions to bridge over St. Catherine Bayou on Lower Natchez-Woodville Rd., incl. 2 concrete piers, 1 concrete abutment, one 51 ft. I-beam span, concrete slab deck, 35,000 lb. structural steel, 1,594 ft. timber piling.

Tex., Houston—Aug. 11, by Harris Co., H. L. Washburn, aud., 1,157 ft. timber pile trestle bridge over Spring Creek, West Montgomery Rd. C. P. Haile, Houston, co. engr.

Ont., Welland—See "Contracts Awarded."

CONTRACTS AWARDED

Arkansas—State Hy. Comn., Little Rock, bridges in Carroll Co., to Blackshire & Blackshire, Fayetteville, $53,425 est. $59,500—Clay Co., to W. L. Sharpe, 3532 Midland St., Memphis, Tenn., $29,945 est. $30,000—Union Co., to J. F. Mullins, Pine Bluff, $77,017 est. $80,000—White Co., to W. P. McGeorge Co., Pine Bluff, $34,276 est. $37,000. Grand total $199,669.

Calif., Los Angeles—Bd. P. Wks., City Hall, viaduct over Atchison, Topeka & Santa Fe R.R. at 6th St., to R. E. McKee, Central Bldg., $181,885. Noted May 29 under "Grade Crossings."

Calif., Los Angeles—Bd. P. Wks., City Hall, five 62 ft. span rein.-con. girder bridge, 56 ft. wide with two 5 ft. sidewalks over Los Angeles River, at Washington St., to General Eng. Corp. Ltd., 740 South Bway., $204,320. Noted June 5.

Calif., Riverton—State Hy. Comn., Sacramento, one 60 ft. and two 54 ft. span rein.-con. girder bridge on concrete piers, bents over South Fork American River, El Dorado Co., also grading, untreated gravel or stone surfacing approaches, to R. Hunter, 3408 Brockway St., Sacramento, $25,107. Noted July 3.

Iowa—State Hy. Comn., Ames, bridges, culverts in Decatur Co., to A. Emmert, Grinnell, $11,376—Decatur Co., to Zitterell-Mills Co., Webster City, $7,990—Decatur Co., to Snyder & Johnson, Humboldt, $27,090—Floyd and Hancock Counties, to Iowa Bridge Co., 19th St. and Eastern Blvd., Des Moines, $1,744 and $8,185 respectively—Floyd Co., to Flower & Floyd, Eagle Grove, $3,168 — Floyd and Hancock Counties, to C. A. Holvik, Mason City, $11,685 and $4,718 respectively—Guthrie Co., to B. Cole & Son, Ames, $19,258—Lee Co., to A. Melberg, Cedar Rapids, $38,424—Linn Co., to Schaef & Jakobsen, Lake Park, $18,215—Monroe Co., to J. J. Grose, Des Moines, $2,589 — Montgomery Co., to Wilson Concrete Co., Red Oak, $6,950—Wayne Co., to Kelley & Overman, Villisca, $9,779—Wright Co., to Hirt & Loder, Woolstock, $735. Grand total $171,906. Noted July 3.

Ia., Iowa City—Johnson Co., three tubular pier bridge, moving, erecting 60 ft. pony truss bridge, to Iowa Bridge Co., 19th St. and Eastern Blvd., Des Moines, $5,065. No award yet made grading, incl. 64,725 cu.yd. excav., 22,630 sta. yd. overhaul.

Maryland—State Rd. Comn., Baltimore, substructure for bridge over Deer Creek between Harmony Church and Darlington, Harford Co., to Forbes-Murphy Constr. Co., 326 St. Paul St., Baltimore, $17,872; extending triple span concrete arch bridge between Whiteoak and Burtonsville, Montgomery Co., to T. D. Claiborne Co., Garrett Bldg., Baltimore, $16,138.

Michigan—G. H. Greene, resident engr., Alpena, rein.-con. bridge R. Br. 1 of 36-6-21 C-2, Iosco Co., for State Hy. Comn., Lansing, to Bethlehem Steel Co., Bethlehem, Pa., $8,575; C-3, to W. Toebe, Shingleton, $38,317.

Michigan—R. A. Beers, resident engr., Kalamazoo, rein.-con. bridge, M.B.1 of 39-7-12C-1, Kalamazoo Co., for State Hy. Comn., Lansing, to Bethlehem Steel Co., Bethlehem, Pa., $11,575; C-2, to Wickes Eng. Co., Des Moines, Ia., $39,404.

Mo., St. Louis—Bd. P. Serv., City Hall; 100 ft. pedestrian bridge to carry Lindell and Union Blvds. over tracks, to R. J. Blackburn, Inc., 8425 Idaho Ave., for City, Wabash R.R. Co., M. F. Longwill, ch. engr., Exchange Bldg., and Chicago, Rock Island & Pacific R.R. Co., W. H. Peterson, ch. engr., La Salle St. Sta., Chicago, Ill. $131,611. Est. $145,470. Noted June 27.

Montana — State Hy. Comn., Butte, timber bridges in Garfield and Rosebud Counties, to Elliott & Nesbitt, Sandpoint, Idaho, $30,601—reconstructing 8 timber bridges in Ravalli Co., to J. Item, Hamilton, $12,710—concrete and 4 timber bridges in Phillips Co., L. V. Lockwood, Glasgow, $12,289—concrete bridge in Powell Co., steel, concrete bridge in Cascade Co., to McGuire & Blakeslee, Great Falls, $14,397 and $14,397 respectively—Beaverhead Co., to T. W. McGreever, Butte, $6,182. Grand total $90,576.

New York—A. W. Brandt, comr. Hys., Albany, bridges in Westchester Co., to D. Deering, Inc., Norwalk, Conn., $17,720 est. $22,093 — Ulster Co., to J. J. Farley Corp., Croton-on-Hudson, $73,634 est. $87,545—Herkimer Co., to C. Scialdo, Herkimer, $46,292 est. $66,982. Grand total $137,646. Noted July 10, under "Streets and Roads."

Bridges (Continued)

New York and New Jersey — Port of New York Authority, 80-90 8th Ave., New York, constructing New York approach to Hudson River Bridge, Contr. HRB and vehicular tunnel in West 178th St., New York, Contr. H.R.B.-8, to Cornell Contg. Co., Grand Central Terminal, New York, $746,679 and $1,766,945 respectively. Noted June 26.

O., Cincinnati—Comrs. Hamilton Co., asphalt bound macadam retreading 38,000 sq.yd. Sheed Rd., to W. E. Pickelheimer, Newtonville, $21,660. **Est.** $29,640. Noted June 26.

O., Warren—Comrs. Trumbull Co., improving Warner Rd., to Kelley-Meyer Co., South Side Bank Bldg., Youngstown, $80,000.

O., Youngstown—Bd. Control, curbing, sidewalks, concrete paving 9,050 sq.yd. Belle Vista Ave., to Lee Tiberio Constr. Co., Ellenwood Ave., $29,332.

Oklahoma—See "Streets and Roads."

Pa., Uniontown—See "Streets and Roads."

Tex., Houston—Harris Co., H. L. Washburn, aud., 577 ft. concrete pile trestle over Goose Creek, Pelly-Baytown Rd., to D. Hall, 403 Union Natl. Bank Bldg., $38,518. Est. $50,000. Noted June 19.

Wisconsin—State and Jackson Co. Hy. Comn., Black River Falls, to R. Blado, Tomah, Baily Bridge, $1,437; Conrad Bridge, $1,414—to E. Blank, Cochrane, Marshall Bridge, $8,937—to R. Millis, Black River Falls, shale surfacing County Trunk P, $1,820; S. T. H. 95, Alma, $2,160; County Trunk N, Franklin, $1,680—to T. E. MacMillan, Black River Falls, Pine Hill Rd., Brockway, $600. Grand total $18,048.

Ont., Brampton—N. L. Powell, engr. Peel Co., County Bldg., Pallgrave Bridge, to Patterson Constr. Co., Brampton; 2 bridges, Erindale, to Erwin & McEackin, Wiarton; Woodhill Bridge, to Kidd & McBride, Inglewood. Est. $35,000. Noted May 22.

Ont., Welland—Toronto Hamilton & Buffalo Ry., James and Hunter Sts., Hamilton, R. L. Lathem, ch. engr., double track steel, concrete bridge over Welland River, near here, day labor. Steel to be awarded by contract. $100,000.

STREETS AND ROADS

BIDS ASKED

Ark., Newport—Soon takes bids grading, curbing, guttering, sewers, 7 in. rein.-con. paving 15,500 sq.yd. 3rd St., Street Impvt. Dist. 14. Lund Eng. Co., Home Insurance Bldg., Little Rock, engrs.

Ark., Prescott — New bids about Sept. 1, grading, curbing, rein.-con. paving 10 blocks Street Impvt. Dist. 3. Lund Eng. Co., Home Insurance Bldg., Little Rock, engrs.

California—State Hy. Comn., Sacramento, C. H. Purcell, ch. hy. engr., rescinded bids to have been opened July 30, grading 0.4 mi. Westerly Boundary-Burnt Branch Rd., Trinity Co. Noted July 4.

Calif., Compton—City received no bids grading, 5 in. concrete paving 300,000 sq.ft. Compton Ave., Kemp St., et al. Will readvertise.

Calif., Mills Valley — W. Falley, city clk. rejected bids grading, curbing, concrete and asphaltic concrete paving Corte Madera Ave. (Ridge Dist.), et al. Will readvertise. Noted July 10.

Calif., Redding—Directors Weed-Klamath Joint Road Dist. soon take bids (1st unit) road project, incl. 9.8 acres clearing, 164 cu.yd. unclass. excav., 21,803 sta.yd. overhaul, 2.8 mi. finish earth graded road. $65,000. C. F. Mau, Redding, engr.

Illinois—Aug. 6, by State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, paving 0.47 mi. Route 39, Sect. 12-V-X Piatt Co.; 1.31 mi. Route 85, Sect. 105 Mercer Co. F. T. Sheets, ch. hy. engr.

Ind., Bloomington—Aug. 5, by Common Council, paving East 9th St. $27,400. E. Cooper, Bloomington, clk.

Kentucky—Sept. 5, by State Hy. Dpt., Frankfort, reconstructing, surfacing 10.7 mi. Columbia-Liberty Rd., S. P. 23-A S Adair Co.—4.8 mi. Buena Vista Rd., S. P. 23-B S Gerrard Co.—grading, drainage structures, surfacing 9.2 mi. Scottsville-Nashville Rd., F. A. P. 204-A S Allen Co.—12.9 mi. Fields Hy., S. P. 99-A S Bath and Montgomery Counties—11 mi. Fields Hy., S. P. 99-A S Fleming Co.—4.6 mi. Stanford-Hustonville Rd., S. P. 23-D S Lincoln Co.—grading, drainage structures 6.9 mi. Murray-Hazel Rd. S. P. 9-C G Calloway Co.—surfacing 13.2 mi. Marion-Mayfield Rd., F. A. P. 119-A S Crittenden Co.—6.1 mi. Clarkson-Peonia Rd., S. P. 516-A S Grayson Co.—11.5 mi. Henderson-Morganfield Rd., F. A. P. 51-B C S Henderson Co.—20.5 mi. McKee-Manchester Rd., S. P. 30-D S Jackson and Clay Counties—5.3 mi Nicholasville-Lancaster Rd., S. P. 97-A S Jessamine Co.—9.9 mi. Paintsville-Prestonburg Rd., F. A. P. 133-A B C S Johnson and Floyd Counties—8.2 mi. Benton-Murray Rd., S. P. 70-S and 3.9 mi. Benton-Paducah Rd., S. P. 67-A S Marshall Co.—8 mi. Central City-Rockport Rd., F. A. P. 186-A S Muhlenberg Co.—10.7 mi. Inez-Kermit Rd., S. P. 34-D S Martin Co.—5.9 mi. Beaver Dam-Rockport Rd., S. P. 45-C S Ohio Co.—12.9 mi. Dwarf-Hindman Rd., S. P. 28-SS Perry and Knott Counties—18.5 mi. Hazard-Hyden Rd., S. P. 28-A S Perry and Leslie Counties—2.8 mi. Natural Bridge Rd., S. P. 188-A S Powell Co.—9.6 mi. Morganfield-Wanamaker Rd., S. P. 75-A S Union Co.—B. Johnson, chn.

La., Columbia—Aug. 5, by Mayor, concrete paving 4 blocks Main St. Address City Engineer.

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Maryland—Aug. 5, by State Roads Comn., G. C. Uhl, chn., Baltimore, grading, bridging, surfacing 10 projects in Anne Arundel, Baltimore, Cecil, Dorchester, Frederick, Harford, Howard and Washington Counties. L. H. Stuart, secy.; adv. E. N.-R. July 31.

Massachusetts — Aug. 5, by Dpt. P. Wks., State House, Boston, graveling, bituminous macadam paving 4,500 ft. West Newbury — bituminous macadam paving 11,900 ft. Montague—7,050 ft. West Boylston—5,963 ft. Watertown and Waltham—6,450 ft. Foxborough—bitulithic concrete paving 2,988 ft. Provincetown. A. W. Dean, c/o Dpt. P. Wks., Boston, engr.

Mass., Boston — Aug. 4, by Dpt. P. Wks., J. A. Rourke, comr., City Hall, sheet asphalt or bituminous paving Washington St. $35,000.

Michigan—Aug. 5, by R. W. Roberts, resident engr., Saginaw, concrete paving 2.524 mi. Rd. FO25-21, Contr. 2, 40 ft., Genesee Co., for State Hy. Comn., Lansing.

Michigan—Aug. 6, by C. L. Cowgill, resident engr., Plymouth, concrete paving 11.041 mi. FO81-22, Contr. 2, 20 ft., Washtenaw Co., for State Hy. Comn., Lansing.

Missouri—Aug. 1, by State Hy. Bd., Jefferson City, improving roads in Barton, Charitan, Clark, Douglas, Grundy, Howell, Calloway, Cedar, Cooper, Knox, Monroe, Marion, Morgan, St. Claire, St. Genevieve and Texas Counties. T. H. Cutler, ch. engr.

N. J., Jersey City — Aug. 5, by Bd. City Comrs., City Hall, asphalt on concrete paving Clifton Pl. and Fairmount Ave. $25,000. J. Henderson, city engr.

N. J., Morristown—Aug. 13, by Bd. Freeholders Morris Co., Court House, bituminous concrete on concrete paving 22,000 cu.yd. Morris St. portion Morristown-Hanover Rd. W. Hopkins, co. engr.; adv. E. N.-R. July 31.

N. J., Trenton—Aug. 7, Ewing Twp. Com., grading, sewers, concrete paving 5,275 sq.yd. Stuyvesant Ave., from New Jersey State Hospital, to Lower Ferry Rd. R. B. Bechtel, 219 East Hanover St., engr.

New York — Aug. 19, by A. W. Brandt, comr. Hys., Albany, constructing roads in Albany, Suffolk and Westchester Counties; reconstructing roads in Erie, Fulton, Nassau-Suffolk, Saratoga-Rensselaer, Sullivan, Westchester and Wyoming Counties; adv. E. N.-R. July 31.

N. Y., New York—Aug. 1, by J. Miller, pres. Manhattan Boro, Municipal Bldg., grading, curbing, flagging, sidewalks, 3 in. asphalt block on concrete paving West 185th St. from Fort Washington to Pinehurst Aves.—grading, sheet asphalt paving central portion roadway 145th St.—widening, 4 in. granite block on concrete paving 17th Ave.

N. Y., New York — Aug. 5, by J. Miller, pres. Manhattan Boro, Municipal Bldg., granite block on concrete repaving Marginal Street, Wharf or Place from 14th to 22nd Sts.

O., Chardon—Aug. 4, by Comrs. Geauga Co., paving Burton Station-Johnsons Corners Rd. and Parkman-Bundyburg Rd. $41,090. E. A. Fielder, Court House, engr.

Oklahoma—Aug. 4, by State Hy. Dpt., Oklahoma City, furnishing, applying oil on 28 mi. MKS Hy. 271, Choctaw Co., incl. 185,000 gal. oil $30,000—33 mi. U. S. Hy. 70, Latimer Co., incl. 243,000 gal. oil, $27,000—33 mi. State Hy. 7, Kiowa Co., incl. 264,000 gal. oil, $26,000—21 mi. State Hy. 1, Noble Co., incl. 171,000 gal. oil, $25,000—27.5 mi. State Hy. 60, Tulsa, Robers and Newata Counties, incl. 212,000 gal. oil, $25,000. A. R. Losh, hy. engr.

Okla., Minco—Soon takes new bids grading, curbing, concrete paving 9,250 sq.yd. Paving Dist. 1, Main St. $31,000. Former bids rejected.

Pennsylvania—Aug. 5, by F. S. Williams, clk., City Bldg., Sharon, and L. S. Newton, clk., City Bldg., Farrell, brick on concrete paving 2,700 sq.yd. Beechwood Ave., Farrell and Sharon. L. E. Burnside, City Bldg., Sharon, engr.

Pa., Phila.—Aug. 5, by Dpt. P. Wks., Bur. Hys., A. Murdock, dir., City Hall Annex, Schedule A, grading, graveling 3 streets (1st Hy. Dist.)—Schedule B, asphalt paving (assessment work) 5 streets—Schedule C, vitr. block paving (assessment work) 1 street—Schedule D, furnishing, placing gravel on 4 roads—Schedule E, improving 5 county roads—Schedule F, improvement (paving assessment work) 1 street—Schedule G, grading, improving 1 street—Schedule H, asphalt paving 3 streets—Schedule I, redressed granite block repaving 3 streets—Schedule J, curbing, footway work (city to pay) 5 districts—Schedule L, furnishing, erecting fabricated steel smoke sheathing for Stockley Street Bridge over Port Richmond Branch of Reading River.

Tex., Brackettville—Judge Kinney Co. taking bids and opens same Aug. 11, grading, bridging, in cold rolled asphalt paving 23,000 sq.yd. main road from here. $140,000. E. P. Arneson, Gunter Bldg., San Antonio, engr.

Tex., Childress — Comrs. Childress Co., lets contract in September, grading 14 mi. Hy. 5. $70,000. S. D. Bacon, Childress, co. engr.

Tex., Port Arthur—Aug. 8, by City, c/o J. W. O'Neal, mayor, alternate types paving 59,320 sq.yd. $125,000. W. O. Bower, Port Arthur, engr.

Virginia—Aug. 12, by State Hy. Dpt., Richmond, constructing roads, bridges in Southampton, Nansemond, Botetourt and Bedford Counties; adv. E. N.-R. July 31.

Washington—State Hy. Comn., Olympia, bids about September, grading, paving 2 mi. Lake Samish Rd., Whatcom Co., 28 ft. $75,000. G. H. Shearer, Seattle, dist. engr.

Wisconsin—Aug. 4, by State and Brown Co. Hy. Comns., Green Bay, asphalt paving 1.77 mi. Green Bay-Sturgeon Bay Rd., S. T. H. 54, C. A. P. 3362—concrete paving 0.176 mi. Mission Rd., C. T. K, C. A. P. 3364—4.45 mi. Green Bay-Shawano Rd., S. T. H. 29—1.178 mi. Duck Creek-Shawano Rd., County Trunk AA, C. A. P. 3361—2.547 mi. Green Bay-Kaukauna Rd., S. T. Hy. 96, S. A. P. 3363—0.17 mi. South Broadway Slough Rd., C. T Hy H, C. A. P. 3358.

CONTRACTS AWARDED

Ala., Mobile — Mobile Co. Bd. Revenue one course concrete paving Cedar Point Rd., to Hancock Bros., 310 St. Michael St., $144,478.

Arkansas — State Hy. Comn., Little Rock, grading, drainage structures, graveling 4 mi. roads in Carroll Co., to Interstate Constr. Co., Ft. Smith, $54,808 est. $70,000—graveling 17 mi. Pike Co., to M. O. Weaver, Iowa Falls, Ia., $18,031 est. $30,000—concrete surfacing 5 mi. Franklin Co., to Sullivan, Lang & Hagerty, Bessemer, Ala., $105,120 est. $110,000—6 mi. Job 1078 and 5.5 mi. Job 10161 Craighead Co., to J. P. McNulty, Pine Bluff, $108,133 and $102,276 respectively est. $120,000 and $110,000 respectively—grading, drainage structures 9 mi. Drew Co., to Harvey & Jones, Jonesboro, La., $55,314 est. $60,000—9 mi. Garland Co., to James Spencer & Son, Hot Springs, $94,892 est. $100,000—9.5 mi. Lonoke Co., to D. B. Hill, Little Rock, $58,762 est. $70,000—12.5 mi. Logan and Franklin Counties, to Batson Bros., Dardanelle, $69,505 est. $80,000—8 mi. Prairie Co., to S. E. Evans, Ft. Smith, $52,957 est. $50,000—7 mi. St. Francis Co., to Bunnell & Mack Constr. Co., Paragould, $77,895 est. $80,000. Grand total $797,693.

Ark., Wynne — Grading, curbing, guttering, sewers, rein.-con. paving 7,200 sq.yd. Street Impvt. Dist. 4, to Walsh & Thomas, Little Rock, $21,081.

California — State Hy. Comn., Sacramento, grading, asphaltic concrete paving 7.6 mi. Fowler Switch-Fancher Rd., Fresno Co., to Peninsula Paving Co., Standard Oil Bldg., San Francisco, $257,557. Noted June 12.

California — State Hy. Comn., Sacramento, grading, concrete paving 2.6 mi. Sacramento Co., to Frederickson & Watson & Frederickson Bros., 354 Hobart St., Oakland, $89,029—grading, asphaltic concrete paving 5.8 mi. Yolo Co., to Jones & King, Hayward, $129,575—1.4 mi. San Joaquin Co., to Clark & Henery, Chancery Bldg., San Francisco, $57,147—bituminous macadam surfacing 12.6 mi. Los Angeles Co., to S. W. Paving Co., Washington Bldg., Los Angeles, $134,330—road mixed oil treated gravel or stone surfacing Del Norte Co., to Hemstreet & Bell, Marysville, $88,405 — widening 6.2 mi. Riverside Co., to S. Finley, Santa Ana, $34,402. Grand total $532,888. Noted June 26.

California—State Hy. Dpt., Sacramento, oil treated crushed gravel or stone surfacing 13.9 mi. Cottonwood-Democrat Springs Rd., Kern Co., to A. Teichert & Son, 1846 37th St., Sacramento, $141,335.

Calif., Eureka—Humboldt Co., emulsified asphalt surfacing 25 mi. roads, to J. P. Holland, 1834 McKinnon Ave., San Francisco, at $0.018 sq.ft.

Calif., Glendale—Improving 4,000 ft. Ethel St., to Atkinson & Reish, 1241 Ethel St., Glendale, $32,206.

Calif., Los Angeles—Los Angeles Co., grading, asphaltic concrete paving Norwalk and Puente Mill Rds., to G. H. Oswald, 366 East 58th St., $58,070; grading 93,697 cu.yd. 3rd St., to W. F. Peck Co., 1120 Las Palmas Ave., $25,495. Noted June 26.

Calif., Los Angeles—Bd. P. Wks., concrete curbing, sidewalks, 8 in. vitr. sewers in 67 St., to Griffith Co., Railway Bldg., $47,025.

Calif., Redwood City—San Mateo Co., grading, curbing, walks, concrete paving Glendale and Edgewood Rds. et. al, to Union Paving Co., Call Bldg., San Francisco, $37,862.

Calif., San Carlos—Grading, 3 in. asphaltic concrete on 4 in. waterbound macadam surfacing Arroyo Ave., Chestnut St., to Union Paving Co., Call Bldg., San Francisco, $34,465.

Calif., Santa Ana—Orange Co., grading 6.2 mi. Ortega Hy., to H. W. Rohl, Roosevelt Bldg., Los Angeles, $175,256.

D. C., Wash.—District Comrs., District Bldg., concrete roadways, to Elkins Paving & Constr. Co., 834 Holly St., $173,560—and to W. F. Brenizer Co., 101 New York Ave. N. E., $160,385—resurfacing, to Corson & Gruman Co., $328,760—asphalt resurfacing, to Cranford Co., 3056 K St. N. W., $82,994—asphalt paving to Union Paving Co., Wash., D. C., $217,801—cement curbing, guttering, to Highway Eng. & Constr. Co., 7th and T Sts. N. E., $243,003. Grand total $1,206,503. Noted June 5.

Florida—State Road Dpt., Tallahassee **(P. means Project)** paving P. 62-A, and P. 62-D, Osceola Co., to L. B. McLeod Constr. Co., Williston, $95,410 and $275,155 respectively—P. 708, Jefferson Co., to Duval Eng. & Contg. Co., Dyal Upchurch Bldg., Jacksonville, $117,044—P. 806-A, Hendry Co., to E. D. Powers Constr. Ct., West Palm Beach, $177,922—P. 66, Sarasota Co. and P. 57, Nassau and Duval Counties, to R. C. Hoffman Constr. Co., Miami, $116,626 and $158,028 respectively—561 ft. bridge P. 75, Collier Co., to Central Station Equipment Co., Inc., Miami, $113,938—783 ft. bridge, P. 715-B, Union and Bradford Counties, to Florida Bridge & Constr Co., Orlando, $72,612. Grand total $1,130,735. Noted June 12.

Streets and Roads (Continued)

Idaho—J. D. Wood, comr. P. Wks., Boise, grading 5.541 mi. Benewah Co., to Lawler & Maguire, Butte, Mont., $124,848—8.025 mi. Jefferson Co., to J. C. Maguire, Butte, Mont., $47,088—1.485 mi. Bonneville Co., to Sutherland & Burns, Missoula, Mont., $26,783—6.98 mi. Kootenai Co., to J. F. Konen, Lewiston, $61,358—grading, crushed rock surfacing 6.594 mi. Benewah Co., to C. Nyberg, Realty Bldg., Spokane, Wash., $72,869—11.818 mi. Bonneville Co., to Robinson Constr. Co., Twin Falls, $84,229—7.31 mi. Clark Co., to W. Hoops, Twin Falls, $51,778—grading, incl. 90 ft. and 115 ft. concrete bridge on 15.709 mi. and crushed graveling 3.485 mi. Nez Perce and Clearwater Counties, to Ryberg, McHugh & Cowley, Boise, $319,041. Grand total $787,994. Noted July 3.

Ill., Galesburg—Knox Co., grading 5.5 mi. State Aid Route SA8, to Swords, McDougal & Knapp, Peoria, $17,664—furnishing, spreading 2,000 tons gravel on 1 mi. State Aid Route 20, 12 ft., to J. Donason, Moquon, at $1.40 per ton—bridges, culverts on State Aid Route 4, to Rodenhouser & Smith, 556 Olive St., Galesburg, $9,112.

Ind., Decatur—Adams Co. concrete paving Henry Graber Rd., Washington Twp., to O. W. P. Macklin, Decatur, $19,887. Est. $24,811. Noted July 3.

Ind., Decatur—Adams Co., concrete paving A. N. Springer Rd., Monroe Twp., to Winton & Smalley Co., Celina, O., $21,221. Est. $29,158.

Ind., Lawrenceburg—Dearborn Co., macadam surfacing 2 mi. Otis Nowlin Rd., to F. Nowlin, Harrison, O., $19,600. Est. $25,105. Noted June 26.

Ind., South Bend — St. Joseph Co., concrete paving R. C. Stephenson Rd., to Rieth-Riley Constr. Co., Goshen, $36,235. Noted June 18 Daily.

Iowa—State Hy. Comn., Ames, grading 3.183 mi. roads in Floyd Co., to J. J. Boyett, Kennett, $7,735—5.507 mi. Floyd Co., to M. T. McGuire, Algona, $19,282—2.961 mi. P-647, and 11.429 mi. P-646, Guthrie Co., to E. V. Martin, Ames, $27,735 and $188,337 respectively—0.483 mi. Wright Co., to Moe & Nelson, Belmond, $1,514—graveling 10.98 mi. Clayton Co., to Okey & Sturmer, Cassville, $18,997—6.771 mi. Wright Co., to C. L. Yost, Bristow, $2,918—130,910 ft. cable guard rail, 858 anchors, 14,513 posts, various counties, Dist. 7, to G. Cronkhite, Perry, $24,954. Grand total $291,472. Noted July 3.

Ia., Davenport—Asphalt paving Marlo Ave., Crestline Dr.-Middle Rd., to McCarthy Impvt. Co., Kahl Bldg., Davenport; 3 alleys, to Central Eng. Co., Putnam Bldg., Davenport. Noted July 10.

Ia., Deninson — Crawford Co., improving Ricketts-Schleswig and Kenwood Division Rds., incl. clearing, grubbing, 82,228 cu.yd. earth excav., 2,400 cu.yd. channel change, 80,000 sta.yd. overhaul, to G. W. Condon Co., 223 Grain Exch. Bldg., Omaha, Neb., $21,610.

Ia., Grundy Center — Grundy Co., graveling roads, to B. Alexander, Marshalltown, $12,838. Noted June 5.

Ia., Sibley—Osceola Co., grading 14.068 mi. local roads, to G. Osterman, Ocheyedan, $18,304. Noted June 4 Daily.

Kansas—State Hy. Dpt., Topeka, grading, culverts 8.62 mi. U. S. Hy. 40-N Federal Aid Project 371-D, 30 ft., Osborne Co., to Meade-Hardman Co., Alton, $31,898; sand gravel or chat surfacing 13.27 mi. U. S. Rd. 36, Kansas Project 976, Phillips Co., to M. W. Watson, Topeka, $25,478.

Kan., Wichita—City, to H. T. Ritchie, 1820 North Mosely St., improving Kansas Ave., Bway., Minneapolis and Orme Aves., 14,750 sq. yd asphaltic concrete paving at $2.27 per sq.yd., 475 sq.yd. asphaltic top dressing $1.50, 7,000 cu.yd. excav., $0.75 and $0.85 per cu.yd., 44,300 lb. reinforcing steel $0.045 per lb. — to Globe Constr. Co., 1041 North Water St., improving 13th and Waterman Sts., St. Francis, Yale, Murdock, Palisade and Pearce Sts., 20,520 sq.yd. concrete paving at $1.60, 8,235 cu.yd. excav. $0.75 and $0.80, 1,175 sq.yd. brick paving $3.15 and $1.60, 84,100 lb. reinforcing steel 0.05—to V. W. Lafever, 1323 Fannie Ave., improving Kansas and Minneapolis Aves., Bway., Poplar and Waterman Sts., 1,340 ft. curbing $0.45, 3,560 ft. guttering, $0.49, 4,519 ft. curb and gutter $0.84, 140 ft. curb and gutter removed $0.18—to Hurst & Campbell, 410 North Volutsia St., improving 13th and Waterman Sts., Murdock, Pearce and Yale Aves., 2,825 ft. curb $0.44, 2,410 ft. gutter $0.49, 5,550 ft. curb and gutter $0.84, 70 ft. curb and gutter removed $0.25—to F. S. Kensler, 1558 South Water St., improving Ormest and Waterman Sts., 780 ft. curb $0.44, 1,950 ft. gutter $0.48, 2,510 ft. curb and gutter $0.83, 170 ft. curb and gutter removed $0.15—to J. A. Jones, 1428 Pattie Ave., improving Waterman St., Palisade and St. Francis Aves., 720 ft. curb $0.40, 2,130 ft. gutter $0.50, 2,400 ft. curb and gutter $0.84. Noted June 26.

Maryland—State Rds. Comn., Baltimore, concrete paving 0.91 mi. Harford Co., to P. Reddington & Son, 2 East Lexington St., Baltimore, $29,852—concrete shoulders on 3.22 mi. hy. Harford Co., to F. D. Carozza & Son, 2444 North Charlees St., Baltimore, $20,379 — bituminous macadam paving 4.87 mi. Carroll Co., to E. C. Valentine, Frederick, $45,654. Grand total $95,885. Noted July 3.

Maryland — State Rds. Comn., Baltimore, graveling 1 mi. St. Marys Co., to H. W. Hewitt & Son, Valley Lee, $7,429; concrete paving 1 mi. Baltimore Co., to T. Fratta, 3501 East Pratt St., Baltimore, $10,727. Noted July 10.

Maryland — State Roads Comn., Baltimore, sheet asphalt paving 0.44 mi. Baltimore Co., to American Paving Co., Montebello Ave., Baltimore, $52,239—concrete paving 0.2 mi. Garrett Co., to Cumberland Constr. Co., Cumberland, $6,463—18,000 sq.yd. Baltimore Co., to P. Averza, 104 North Highland Ave., Baltimore, $28,564—11,000 sq.yd. Baltimore Co., to P. E. Rawlins, 2400 Aisquith St., Baltimore, $18,717—concrete shoulders on 2 mi. Montgomery Co., to Loomis Constr. Co., 1014 Wisconsin Ave., Wash., D. C., $13,314. Grand total $119,297. Noted July 10.

Maryland — State Roads Comn., Baltimore, concrete paving 1 mi. Dorchester Co., to Aiello Constr. Co., Gough and Dean Sts., Baltimore, $25,644—1.25 mi. Cecil Co., to G. & L. Contg. Co., Maple Ave., Baltimore, $25,865—5.34 mi. St. Marys Co., to D. Marine, 236 Albermarle St., Baltimore, $37,425—concrete shoulders on 0.25 mi. Worcester Co., to Hannemann-Burroughs Co., Salisbury, $3,360—penetration macadam paving 1.96 mi. Washington Co., to Thomas, Bennett & Hunter, Westminster, $51,209. Grand total $143,503.

Md., Baltimore—Concrete paving 13,900 sq.yd. streets listed in Contr. 557, to Baltimore, Asphalt Block & Tile Co., 1320 North Monroe St., $56,113.

Massachusetts — Metropolitan Dist. Com., 1 Ashburton Pl., Boston, grading, rein.-con. paving 31,000 sq.yd., bituminous macadam paving 24,000 sq.yd. Forest and Main Sts., Medford and Stoneham, to C & R Constr. Co., 75 Bradeen St., Roslindale, $183,875.

Massachusetts—Dpt. P. Wks., Boston, graveling, bituminous macadam paving 3,950 ft. hy. in Spencer, to F. Seretto & Sons, Inc., 22 Franklin St., Arlington, $15,411—bituminous macadam paving 3,000 ft. West Springfield, to D. O'Connell & Sons, 480 Hampden St., Holyoke, $23,414—4,750 ft. Hanson, to E. G. Sargent, 17 Saville St., Quincy, $18,700 — 2,133 ft. Sharon to Arute Bros., 499 South Main St., New Britain, Conn., $13,286 — 38,078 ft. Beckett and Lee, to Lane Constr. Corp., 134 State St., Meriden, Conn., $282,590—20,883 ft. Dudley and Southbridge, to Waterbury Road Constr. Co., 983 Main St., Hartford, Conn., $213,576—widening with rein.-con. 18,000 ft. Attleboro and North Attleboro, to J. J. McHale, 104 Ferris St., Pawtucket, R. I., $154,507—rein.-con. and bituminous macadam paving 24,257 ft., Andover and North Andover, to Greenough Constr. Co., 200 Calvery St., Waltham, $315,347. Grand total $1,036,831. Noted July 10.

Pa., Phila.—Dpt. P. Wks., Bureau Eng. & Surveys, A. Murdock, dir., City Hall Annex, to J. Herzog, 4314 Old York Rd., grading Ellet, Forrest, Oakview and Williams Sts., $3,012; Woolston St. $2,015—to M. Masse, 3936 West Reese St., Sedgwick St. $3,093—to Union Paving Co., Broad and Stiles Sts., asphalt paving (assessment work) Hoopes St. $2,107; Magdalena St. $5,906; redressed granite block repaving track area Somerset St. $5,086—to F. L. Curtis, 6736 State Rd., improving Cresco Rd. $2,895—to United Paving Co., Widener Bldg., Spring Lane Rd., $12,725. Grand total $36,839.

Massachusetts—Dpt. P. Wks., Boston, rein.-con. paving 23,405 ft. hy. in Randolph, Quincy and Milton, to D. M. Biggs & Co., 60 Marsh St., Dorchester, $253,283. Noted July 3.

Mass., Boston—Dpt. P. Wks., recut granite block paving streets in Ward 3, to S. J. Tomasello, Bay St., Dorchester, $26,989. Noted July 10.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., City Hall, sheet asphalt paving Warren St., Ward 21, to Beatty Constr. Co., 66 Warren St., Roxbury, $34,052.

Mass., Brookline (br. Boston)—Grading, surfacing Asheville, Bonard, Clearwater, Crassmere, Ledyard and Russett Rds., to C. M. Callahan Co., Inc., 23 South Fairview St., West Roxbury.

Mass., Brookline (br. Boston) — Grading, asphalt paving Newton St., to C. M. Callahan Co., Inc., 23 South Fairview St., West Roxbury. Est. $25,000.

Mass., Newton — Constructing Avalon Rd., Larchmont and Allen Aves. as hys., to P. J. O'Malley, 72 Massasoit St., Waltham. Est. $25,000.

Mass., Swampscott — Grading, sheet asphalt paving Whitman Rd., to M. McDonough, Swampscott. Est. $25,000.

Michigan—R. A. Beers, resident engr., Kalamazoo, grading 3.2 mi. Kalamazoo Co., to A. Jeffrey, Saginaw, for State Hy. Comn., Lansing, $140,531.

Michigan—H. C. Fleming, resident engr., Grand Rapids, grading, shaping, concrete paving 0.33 mi. Ottawa Co., to S. Solomon, Lansing, for State Hy. Comn., Lansing, $26,474.

Miss., Yazoo City—Bd. Supvrs. Yazoo Co., graveling 18.2 mi. roads in Dist. 3, to Shruptrine Constr. Co., Forest, $14,398; gravel, to Concrete Sand & Gravel Co., Hattiesburg, $28,980. Noted June 26.

Mo., Kansas City—Concrete paving Elmwood Ave., to Torson Constr. Co., 46th and Gilham Rd., $47,925.

Montana — State Hy. Comn., Capitol, Butte, grading 8.723 mi. Powell Co. and 15.936 mi. Dillon-Idaho state line Rd., to L. T. Lawler, Butte, $76,846 for former project—35.009 mi. Garfield and Rosebud Counties, and 13.148 mi. Phillips Co., to Stevens Bros., St. Paul, $95,402 and $51,574 respectively — 11.693 mi. Ravalli Co., to Sutherland & Burns Constr. Co., Missoula, $41,477—graveling 10.324 mi. Fergus Co., to Basin Constr. Co., Lewistown, $13,027—15.463 mi. Deer Lodge Co., to E. N. Brown, Bozeman, $40,895—11.089 mi. Cascade and Judith Basin Counties, to Smith & Thornquist, Great Falls, $46,388. Noted July 10 Daily.

New Hampshire—State Hy. Comn., Concord, 6 in. one course rein.-con. on 8 in. gravel paving 3.78 mi Lafayette Rd. in Seabrook and Hampden Falls, to A. D. Bridges Sons, Inc., Hazardville, Conn., $185,068. Noted July 10.

N. J., Dover—Twp. Comn., Town Hall, grading, curbing, sidewalks on Gateway, North Gateway, South Gateway, East Gateway and Thomas Sts., to Russo Bros., Dover. Est. $25,000.

N. J., Rutherford—Bd. Boro Council, Boro Hall, grading, curbing, rein.-con. paving Erie Ave., to P. Giuliani, 447 North Main St., Lodi, $18,473. Noted July 10.

New York — A. W. Brandt, comr. Hys., Albany, concrete paving 5.12 mi. Broome Co., and concrete and bituminous macadam paving 5.93 mi. Tioga Co., to O. P. Williams Constr. Co., Oneonta, $320,643 and $470,158 respectively, est. $401,057 and $649,837 respectively—bituminous macadam paving 3.36 mi. Erie Co., to Brayer Bros., 1515 Williams St., $276,786 est. $389,951—7.07 mi. Hamilton Co., to Zoli & DeMichiel, Torrington, Conn., $339,546 est. $507,067. Grand total $1,407,133. Noted July 10.

N. Y., Long Island City—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., to Meehan Paving & Constr. Co., 90 West St., New York, asphalt paving 94th St. $8,083; 86th Rd. $5,318; 103rd St. $5,051; Catalpa Ave. $7,702; Bell Blvd. $48,424—to Borough Asphalt Co., 1301 Metropolitan Ave., Brooklyn, 29th St., $28,186; 34th Ave. $9,012—to W. P. MacDonald Constr. Co., 381 4th Ave., New York, 30th St., $33,811—to Peace Bros., Inc., 57 North Lawrence St., Flushing, Weller Ave., $11,270—to Flushing Contg. & Eng. Co., 66 Wyoming Ave., Flushing, 132nd St., $4,988—to T. J. O'Hanlon, Inc., 58th St., $7,026. Grand total $168,871. Noted July 10.

N. Y., New York—H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., bituminous concrete paving Prospect Pl. and asphalt paving East 196th St., to Clay Contg. & Building Co., $6,958 and $30,837 respectively—Johnson and Baychester Aves., to C. D. Beckwith, Inc., Seneca Ave. and Edgewater Rd., $58,742 and $260,027 respectively—curbing Fenton Ave., to F. Gabriele, 2750 Creston Ave., $7,900; sewer in Lurting Ave., to Nabrum, Inc., 2556 Wallace Ave., $1,922—in St. Lawrence Ave., to Caserta Constr. Co., $3,808. Grand total $370,194. Noted July 10.

N. Y., New York—J. Miller, pres. Manhattan Boro, Municipal Bldg., grading, granite block paving Broome St., to Casper Helbock Co., 633 Wales Ave., $76,009; asphalt paving 5th Ave., to Cleveland Trinidad Paving Co., Flushing, $122,061. Noted July 3.

N. Y., St. George—J. A. Lynch, pres. Richmond Boro, Boro Hall, concrete repaving Rockland Ave., to Vanbro Constr. Co., 24 Elizabeth St., West New Brighton, $33,761. Noted July 3.

O., Cleveland—City, grading, brick paving 8,470 sq.yd. Behrwald Ave. and oil asphalt paving 3,350 sq.yd. Ramona Blvd., to Highway Constr. Co., Builders Exch. Bldg., $57,291 and $18,106 respectively; waterbound macadam paving, culverts on 760 sq.yd. Doan Brook, to Riley Bros., The Arcade, $4,005. Grand total $79,402.

Oklahoma—State Hy. Dpt., Oklahoma City, to Ellis & Lewis, 507 Surety Bldg., Muskogee, concrete slab surfacing 4.993 mi. Creek Co. $70,718 est. $75,000; 2.82 mi. Federal Aid Project R 18-C $38,915 est. $45,000; 4 mi. Sect. G $52,718 est. $55,000; 3.42 mi. Sect. H $46,263 est. $50,000, 3.88 mi. State Aid Project 671-C, $48,003 est. $52,000; asphalt surfacing 3.85 mi. Creek Co. $57,842 est. $60,000—to J. E. Foty, Dallas, Tex., concreet slab surfacing 4.668 mi. Federal Aid Project 244-A $65,282 est. $70,000; 3.395 mi. Sect. B $56,974 est. $64,000; 1.075 mi. Sect. C, $16,128 est. $25,000, all Jefferson Co.; 4.796 mi. Federal Aid Project 144-A $70,629 est. $75,000, 5.75 mi. Sect. B $77,261 est. $81,000; 1.635 mi. Sect. H $22,822 est. $25,000, all McClain Co.—to T. Collins, 808 East 17th St., Oklahoma City, 4 mi. State Aid Project 438-A $58,633 est. $63,000; 3.94 mi. Sect. B $52,828 est. $56,000—to Brooks & Dahlgren, Insurance Bldg., Oklahoma City, 2.5 mi. Federal Aid Project 221-C $40,771 est. $45,000; 3.157 mi. Sect. D $50,357 est. $53,000—to Ward Beekman Co., 1801 East 9th St., Oklahoma City, 7.089 mi. McCurtain Co., $78,750 est. $80,000; 4.949 mi. Carter Co. $76,142 est. $85,000; 2.212 mi. Seminole Co. $28,356 est. $33,000—to Gravell & Hamblin, Manhattan Bldg., Muskogee, 3.348 mi. Muskogee Co. $59,085 est. $65,000; rein.-con. bridge at Boynson, Muskogee Co., $21,334 est. $25,000. Grand total $1,090,111. Noted July 17.

Okla., Bartlesville—W. K. Blockly, city clk., concrete paving 15,000 sq.yd. 1 alley, 1 street and 5 avenues, to Hamilton Constr. Co., Bartlesville, 6 in. $2.46 7 in. $2.24 per sq.yd. Noted July 3.

Pa., Phila.—Dpt. P. Wks., Bureau Eng. & Surveys, A. Murdock, dir., City Hall Annex, Contr. 104—Manayunk elevated—Cresson St. Station, grading, paving, sewers Levering Avenue and intersecting streets, to J. J. McHugh, 1617 Rice St., $229,243.

Pa., Pittsburgh—Allegheny Co. grading, drainage structures, curbing, sewers, foot walks, paving 7,000 sq.yd. Bailies Run Rd., East Deer Twp., to F. S. Tillman, Tarentum, $35,000.

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Streets and Roads (Continued)

Pa., Pittsburgh — Grading, curbing, sewers, walks, paving 4,000 sq.yd. Marion, 3rd and Edna Sts., East Deer Twp., to F. S. Tillman, Tarentum. $25,000.

Pa., Tarentum—Grading, curbing, paving 7 streets, to F. S. Tillman, Tarentum. $39,260.

Pa., Uniontown—Fayette Co. relaying, resurfacing Mt. Vernon Ave., to Bituminous Paving & Resurfacing Co., Connellsville. $7,382—surfacing West Pl., to R. McIntyre, Uniontown. $4,118—concrete retaining walls on East Penn St., to M. Fee, Uniontown, $5,000—along Mt. Vernon Ave., to F. Sally, Fairgrounds, $2,456—bridge over East Penn St., to Luten Bridge Co., Clarksburg, W. Va., $8,620. Grand total $28,216.

Tennessee—State Dpt. Hys. & P. Wks., Nashville, paving 11.233 mi. Williamson Co., to Ziegler Bros., Amer. Trust Bldg., Nashville, $304,275—8.278 mi. Madison Co., to Sullivan, Long & Haggerty, Bessemer, Ala., $197,615—paving 10.44 mi. hy. and approach to 2 bridges, Marion Co., to Carter Gamble Co., Chattanooga, $235,877—grading, drainage structures 6.737 mi. Sequatchie Co., to Discus Bros., Waynesville, N. C., $41,028—3.882 mi. Macon Co., to Lebanon Bridge Co., Springfield, $63,958. Grand total $842,753. Noted July 3.

Tennessee—State Dpt. Hys. & P. Wks., Nashville, concrete bridge over Briar Creek near Tate Springs, Grainger Co., to Young & Lyons, Rogersville, $4,121; 5 timber bridges on 0.947 mi. State Hy. 76, Fayette Co., to Prentice & Prentice, Little Rock, $44,963.

Tex., Corpus Christi—Nueces Co., to Cage Bros., Corpus Christi, improving 11 mi. Flour Bluff Rd., $46,631; 22 mi. Sunshine, Alta Vista and Old Brownsville Rds., $45,671; shell surfacing 7 mi. Dump Rd. $31,012—to E. G. Castleberry, Corpus Christi, shell surfacing 16 mi. Leopold Street Extension, Five Point, McKenzie and Savage Rds. $34,820—to Brown & Root, Corpus Christi and Georgetown, improving 14 mi. Robstown-Petronia Rd., $60,343—to G. H. Dunn & Co., Port Arthur, bituminous surfacing 12 mi. Bluntzer-Banquette Rd. $68,961. Grand total $287,438.

Tex., Mount Vernon—Concrete curbing, guttering, grading, rein.-con. paving 9,151 sq.yd., to General Constr. Co., 414 Capps Bldg., Ft. Worth, $25,478. Est. $27,000. Noted July 10.

Tex., Nacogdoches—For 2 in. rock asphalt on rock paving 25,000 sq.ft. driveways on campus State Teachers College, to T. L. Janes & Co., Ruston, La., $48,684.

Utah—State Rd. Comn., Salt Lake City, concrete paving 1.08 mi. hy. through Tooele City, to Christensen & Gardner, Salt Lake City, $32,172. Est. $28,878. Noted July 10.

Utah—State Rd. Comn., Salt Lake City, grading 2.38 mi. Davis Co., to A. G. Young & Co., Richfield, $18,853. Est. $20,505. Noted July 10 Daily.

Utah, Salt Lake City—City Comn., curbing, guttering, concrete paving Windsor, Lake, Belmont and Princeton Sts., to Gibbons & Reed, Continental Bank Bld., $95,550. Noted July 10.

Wash., Olympia—Thurston Co., constructing 3 mi. Yelm-St. Clair Cut-off, to Halleran Bros., 2352 Bway., Seattle, $30,373. Est. $28,850. Noted May 22.

Wash., Seattle—Bd. P. Wks., paving 35th Ave. Southwest et al., to Moceri Bros., 813 29th Ave., $59,147.

Wis., Milwaukee—Dpt. P. Wks., D. McKeith, comr. to Schwern Bros., 1703 Weil St., improving Alley between 17th and 18th Sts., $14,625; between South 16th and 17th Sts. $1,677;—to Parkinson Constr. Co., 3513 Highland Ave., alley between 23rd and 24th Sts. $1,761, between 14th and 15th Sts. $1,569, North 23rd and Hope Sts. $508, West Capitol Dr. $3,363—to J. C. Blukin & Son, 1299 Achilles Ave., alley between North 12th and Green Bay Rd., $198—to Guniz & Swilaki, 831 13th Ave., West Forest Home Ave. $3,374; West Ridge Court, $13,478; South 13th St. $33,914; South 35th St., $4,649; North Green Bay Ave., $51,245—to Czerwinski Constr. Co., 816 Clinton St., North 28th St., $13,065; South Whitnall Ave., $25,446—to J. D. Bonness, 1460 Green Bay Rd., North 49th St. $6,723. Grand total $176,335.

Wyo., Cheyenne—City Council curbing, guttering, graveling Impvt. Dist. 14, to A. H. Read Co., Cheyenne, $41,992. Est. $52,000.

B. C., Abbotsford—Concrete curbing, guttering, concrete and asphaltic concrete paving ¼ mi. Yale Rd., to General Constr. Co. Ltd., 736 Granville, Vancouver, $29,887.

Ont., Humberstone — Bituminous macadam paving ½ mi. King St., to Law Constr. Co. Ltd., 225 Sterling Rd., Toronto. Est. $25,000.

Ont., Petersborough — Bitulithic on concrete paving Armour and Park Hill Rds., to Warren Bituminous Paving Co., 54 University Ave., Toronto. Est. $31,000.

Ont., Sudbury—Town, bitulithic paving 2 mi. Copper Cliff Rd., to Warren Bituminous Paving Co., 54 University Ave., Toronto. Est. $50,000.

Ont., Thorold—Concrete curbing, guttering, asphalt, concrete paving 3.63 mi. to S. P. West Constr. Co. Ltd., Detroit St., Sandwich. Est. $100,000.

Ont., Toronto—Concrete paving 2 lanes, to L. P. Acri, 28 Grove Ave., $6,427—lane, to E. Mark, 28 Beaver Ave., $1,974—bitulithic paving Joicey Blvd., to Warren Bituminous Paving Co., Ltd., 54 University Ave., $4,669—asphalt paving Martin Crescent, Martin Rd. and Marmot St., to Kilmer & Barber, Harbor Comn. Bldg., $15,941. Grand total $29,011.

Ont., Toronto—Asphalt on concrete paving part of Queens Quay, to Rayner Constr. Co. Ltd., 159 Bay St., $26,166; Maxwell Ave. and Walter St., to Kilmer & Barber, Harbor Comn. Bldg., $7,687.

Ont., Toronto — Concrete curbing, guttering, bitulithic paving 1¼ mi. Lawrence Ave. E., to Warren Bituminous Paving Co., 54 University Ave., Sect. A $33,682, Sect. B $53,852.

Ont., Toronto—Vitr. tile, concrete storm and sanitary sewers in 2 lanes, to Dilco & Co., 239 Bellwoods Ave., $2,344; in Queens Quay, in Central Harbor development, Queens Quay Dist. Contrs. A and B, to Grant Contg. Co. Ltd., 47 Wellington St. E., $81,449.

EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

Ark., Pine Bluff—Sub-District 1 of D.D. 2, Jefferson Co., c/o A. F. Triplett, Pine Bluff, atty., preliminary plans new ditch and enlarging old ditch, 420,000 cu.yd. excav. $73,000. Baxter Eng. Co., Pine Bluff, engr.

Kan., Council Grove—City, c/o R. M. Armstrong, clk., soon takes bids flood protection work, incl. diking, straightening Elm Creek and Neosho River. $100,000. Black & Veatch, 700 Mutual Bldg. Kansas City, Mo., engrs.

Kan., Minneapolis—Ottawa Co. Drainage Dist., c/o C. D. Rees, R. F. D., revising plans draining 9,929 acres land in D.D. 1 and 2 $58,000. Kansas Eng. Co., 601 Kansas Ave., Topeka, engrs. Noted Mar. 27.

Miss., Biloxi—Harrison Co. bids after Aug. 5, 7,000 ft. rein.-con. step or concave type seawall, 5 ft. high, with sand fill dredged from Gulf bottom, along Gulf of Mexico. $120,000. P. Bonham, Gulfport, engr. Noted July 3.

Tex., Mercedes — Owen Combe, et al., 642 Washington St., Brownsville, granted preliminary permit to irrigate 150,000 acre tract, incl. 2,000-hp. hydro-electric plant, large pumping plant, reservoirs, main canals, and laterals, concrete canal lining, near here. $1,500,000.

BIDS ASKED

Calif., San Francisco — Bd. Comrs. Palais Creek Reclamation Dist., 375 City Hall, bids about Aug. 11, 325,000 cu.yd. dredging, 475,000 tons rock in place. $493,000. M. H. Levy, 375 City Hall, engr.

Kan., Wichita—Aug. 2, at office R. C. Foulston, 608 4th Natl. Bank Bldg., 11.5 mi. drainage channel improvements in Protection and Riverside Drainage Dists., incl. 790,316 cu.yd. excav., 248 station bank clearing, 4.2 ft. 12- to 24-in. corrugated metal pipe, 17 sluice gates. Noted June 12.

Ind., Crawfordsville—Aug. 2, by Comrs. Montgomery Co., Bazil Van Cleave Public Drain, 5,232 ft. main line. $31,000. W. S. Harding, Crawfordsville, engr.

Ind., Laporte—Aug. 2, by Darrow-Rowley & Shields, A. P. Andrews Bldg., constructing 9.45 mi. Bellinger Ditch, for Comrs. Laporte Co. $56,100. J. R. Dummary, Laporte, engr.

Ind., Laporte—Aug. 2, by Darrow-Rowley & Shields, A. P. Andrew Bldg., constructing 21.32 mi. Rodman Ditch, for Comrs. Laporte Co. $50,000. J. R. Dummary, Laporte, engr.

Md., Baltimore — Aug. 6, by Bd. Awards, dredging Baltimore Harbor comprising Patapsco River and tributaries. E. E. Hammond, Recreation Pier; harbor engr.

Mass., Harwich—Aug. 5, by Dpt. P. Wks., Boston, dredging 89,000 cu.yd. channel in Nantucket Sound. A. W. Dean, c/o Dpt. P. Wks., Boston, engr.

Tex., Houston—Aug. 6, at office City Secretary, standard interlocking steel sheet piling for bulkheads on new channel for Buffalo River, Preston and Franklin Aves. W. E. Monteith, mayor.

Tex., Port Arthur—Aug. 5, by City, T. W. O'Neil, mayor, 135,000 yd. levee embankment. J. B. Converse & Co., Box 425, Port Arthur, engrs.

N. S., Port Williams—Aug. 1, by N. Desjardins, secy. Dpt. P. Wks., Ottawa, Ont., extending vessel bed at public wharf. $14,000.

Ont., Whitby—Aug. 1, by N. Desjardins, secy. Dpt. P. Wks., Ottawa, reconstructing 900 ft. superstructure South Breakwater. $35,000.

Que., Sorel—Aug. 5, by N. Desjardins, secy. Dpt. P. Wks., Ottawa, Ont., improving Dock 2, $60,000.

CONTRACTS AWARDED

Mass., Barnstable—Commonwealth of Massachusetts, Dpt. P. Wks., State House, Boston, hydraulic dredging 62,000 cu.yd. in Centerville River, to Trimount Dredging Co., 10 State St., Boston, $21,710.

Mass., Falmouth—Woods Hole Oceanographic Institution, sea wall, Grant Harbor, Woods Hole, to G. B. Macomber, 38 Chauncy St., Boston. Est. $15,000 or more.

Mass., Marblehead—Town, Bd. Selectmen, concrete, retaining wall at Red's Pond, to C. T. Burns, Atlantic Ave. Est. $25,000.

New Jersey — Bd. Commerce & Navigation, State House, V. Gelineau, dir. and ch. engr., to Hill Dredging Co., Atlantic and Somerset Aves., Atlantic City, dredging Oyster Creek and Barnegat Bay, at $0.195 per cu.yd.; dredging channel in Double Creek and building 300 ft. jetty $13,949; dredging Waretown Creek at $0.205 per cu.yd. Noted July 10.

O., Akron—H. G. Sours, aud. Summit Co., dredging Wolf Creek, incl. lowering sewer and water lines, constructing dikes to relieve flooded conditions, to F. George, 1657 Mahoning Ave., Youngstown, $160,819. Est. $200,000. Noted June 26.

Pa., Uniontown—See "Streets and Roads."

Tex., Port Arthur—City Comn., and J. B. Converse & Co., engrs., Port Arthur and Mobile, Ala., and W. O. Bowers, city engr., installing 500 tons sheet steel piling in 1,723 ft. wall, 30 ft. high, also concrete anchor wall, appurtenances, to W. Horace Williams Co., 833 Howard Ave., New Orleans, La., $216,125. Est. $220,000. Noted June 26.

Tex., Rio Hondo—Cameron Co. Water Impvt. Dist. 15 (McLeod-Hood Tract), c/o S. F. Ewing, Harlingen, irrigation work, incl. concrete pipe lines, meters, pumps, to Dodds & Wedegartner, San Benito. Noted July 3.

N. S., Canso—N. Desjardins, secy. Dpt. P. Wks., Ottawa, Ont., dredging, to Berson Dredging Co. Ltd., Canso. Noted Apr. 24.

N. S., Picton—Dpt. P. Wks., Ottawa, Ont., dredging, to Halifax Dredging Co. Ltd., Halifax.

Ontario—Dpt. P. Wks., Ottawa, dredging Oakville, to Russell Constr. Co., Harbor Comn. Bldg., Toronto, $9,844; Owen Sound, to W. L. Forrest, Goderich, $12,768; constructing Pier Head 2, Oakville, to Raynor Constr. Co., Toronto, $19,290; reconstructing West Pier, Port Stanley, to Detroit River Constr. Co., Security Bldg., Windsor; concrete, steel bridge, Port Hope, to R. Weddell, Trenton, $13,000. Noted June 5.

Ont., Pointe Anne—Dpt. P. Wks., Parliament Bldgs., Ottawa, dredging, to Russell Constr. Co. Ltd., Harbor Bldg., Toronto, $73,531.

Public Bond Elections

Coming Bond Elections

Sewage Disposal Plant—Watertown, S. D., election in fall, $200,000.

Outfall Sewer, Disposal Plant—Sulphur, Okla., Aug. 26, $30,000.

Sewage Disposal Plant—Willman, Minn., July 29, $160,000.

Bridges, Paving, etc.—Lefors, Tex., Aug. 2, $3,500,000.

Courthouse—Albany Co., Aug. 14, $225,000.

Waterworks—Foss, Okla., Aug. 5, $30,000.

Bonds Voted

Waterworks Impvts.—Helena, Mont., $200,000.

Waterworks—Mountainair, N. M., $38,000.

Waterworks—Norwood, N. Y., $32,000.

Waterworks—Lucknow, Ont., Gore, Nasmith & Storrie, Toronto, engrs., $71,200.

Courthouse—Moore Co., Tex., Berry & Hatch, Amarillo, archts., $150,000.

School Addition—Missoula Co., Mont., $200,000.

Light and Power Plant and Waterworks Impvts.—Morgan City, La., Swanson & McGraw, Inc., New Orleans, engrs., $175,000.

Sewerage System—Elmsford, N. Y., Denehy & Clarke, White Plains, engrs., $700,000.

Bonds Defeated

Waterworks, Distribution System — Cassville, Mo., $32,000.

High School Addition—Belleville, Ill., $150,000.

School Addition—Norfolk, Neb., $190,000.

FEDERAL GOVERNMENT

PROPOSED WORK

Calif., San Francisco—FEDERAL—Treas. Dpt. at office Sup. Archt., plans by A. Brown, Jr., 251 Kearny St., 4 story federal office, Civic Center.

N. J., West New York—POST OFFICE, etc. —Treas. Dpt. at office Sup. Archt., post office, federal building. J. A. Wetmore, acting superv. archt.

BIDS ASKED

D. C., Wash.—MOTOR VEHICLES, etc.—Aug. 6, by A. L. Flint, genl. purch. officer Panama Canal, motor vehicles, electric motors, air compressor, electric drills, etc., Schedule 2575.

Delaware—DREDGING—Aug. 7, by U. S. Eng. approximately 65,700 cu.yd. from Mispillion River; adv. E. N.-R. July 31.

Ill., Beardstown—REVETMENT WORK—Aug. 13, by U. S. Eng., Customhouse, St. Louis, Mo., 3,100 cu.yd. earthwork and 170,000 sq.ft. stone revetment in repairing and protecting levee; adv. E. N. R. July 31. Noted July 24.

Ind., Lafayette—POST OFFICE—Aug. 22, by Treas. Dpt. at office Sup. Archt., constructing (except elevator) U. S. Post Office; adv. E. N.-R. July 31.

Me., Portland—ELEVATOR, etc.—Treas. Dpt. at office Sup. Archt., taking bids elevator and heating plant at U. S. Marine Hospital.

Michigan—DREDGING—Aug. 19, by U. S. Eng., Detroit, Round Island Middle Ground, St. Mary's River; adv. E. N.-R. July 31.

Mississippi—LEVEE—U. S. Eng., P. O. Box 667, Vicksburg, bids about Aug. 11, 520,000 cu.yd. levee work in Valewood Levee, Stas. 6750-6795; and 340,000 cu.yd. levee work in Fitler Levee, Stations 8096-26 and 8138-65.

Miss., Gulfport—DREDGING—Aug. 21, by U. S. Eng. Office, Mobile, Ala., maintenance dredging 3,600,000 cu.yd. material from Gulfport Ship Channel and Anchorage Basin; adv. E. N.-R. July 31. Noted July 17.

Miss., Pascagoula—DREDGING—Aug. 22, by U. S. Eng. Office, Mobile, Ala., 1,500,000 cu.yd. maintenance dredging in Mississippi Sound Channel; adv. E. N.-R. July 31.

N. J., Fort Monmouth—QUARTERS—Aug. 29, at office Constr. Quartermaster, bachelor officers quarters; field officers quarters; three 4 family apartments; adv. E. N.-R. July 31.

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Federal Government (Continued)

New York—DREDGING—Sept. 2, by Eng. Office, Army Bldg., 39 Whitehall St., New York, 62,900 cu.yd. soft material, removing 200,600 cu.yd. ledge rock in Hudson River at Mulls, 11 mi. south of Albany; adv. E. N.-R. July 31.

N. Y., Brooklyn—OIL LINE—Spec. 6171—Aug. 13, by Yards & Docks, Navy Dpt., renewal, replacement oil suction line, at Naval Hospital; adv. E. N.-R. July 31.

N. C., Fort Bragg—QUARTERS—Aug. 15, at office Con. Q.M., constructing, completing 16 non-commissioned officers, 8 field officers, and 26 company officers quarters; adv. E. N.-R. July 31.

N. C., Fort Bragg—STREETS, etc.—Aug. 15, by Con. Q. M., concrete streets, combination curb, gutter, sidewalks; adv. E. N.-R. July 31.

Tenn., Memphis—SPILLWAY—Aug. 7, by U. S. Eng., Brewer's Lake outlet structure, concrete culvert under U. S. Hy. 60.

Tex., Riverside—HOSPITAL—Aug. 20, by Con. Q.M., March Field, 1 air corps hospital and 12 sets non-commissioned officers quarters; adv. E. N.-R. July 31.

Va., Fort Humphreys—QUARTERS—Aug. 21, at office Con. Q.M., 35 sets non-commissioned officers quarters; adv. E. N.-R. July 31.

Va., Roanoke—POST OFFICE, etc.—Aug. 12, by Treas. Dpt. at office Sup. archt., post office, court house.

Wash., Blaine—INSPECTION STATION—Aug. 26, by Treas. Dpt., at office Sup. Archt., U. S. Customs and Immigration Inspection Station Buildings, on Pacific Hy. and Peace Arch sites.

Wash., Fort Lewis—QUARTERS—Aug. 21, by Con. Q. M., 5 field officers quarters; 13 company officers quarters; 22 non-commissioned officers quarters; adv. E. N.-R. July 31.

Wyoming — ROAD — Aug. 6, by Pub. Rds., Denver, Colo., grading, surfacing 4.027 mi. Cody-Yellowstone Natl. Forest Rd., Shoshone Natl. Forest, Park Co. A. E. Palen, 301 Custom House Bldg., Denver, Colo., dist. engr.

C. Z., Quarry Heights—QUARTERS—Sept. 22, by Dpt. Quartermaster, 4 field officers quarters; 32 company officers quarters; 27 duplex non-commissioned officers quarters; 1 bachelor officers quarters; two 110 and two 200 men air corps barracks, incl. grading town site, roads, walks, water lines, sewers, duct lines, drainage, etc. at Albrook Field; adv. E. N.-R. July 31.

CONTRACTS AWARDED

Idaho—ROAD—Bureau P. Rds., Ogden, Utah, grading 12.2 mi. North and South Hy., Benewah and Latah Counties, to Joslin & McAllister, Spokane, Wash., $46,870; 5.7 mi. Enarille-Murray Natl. Forest Rd., Shoshone Co. and 5.56 mi. Clarks Fork Natl. Forest Rd., Bonner Co., both in Coeur d'Alene Natl. Forest, to J. Tobin & Sons, Spokane, Wash., $68,140 and $55,697 respectively; 3.78 mi. North and South Hy., St. Joe Natl. Forest, Latah Co., to Triangle Constr. Co., 1220 Ide St., Spokane, Wash., $48,272. Grand total $218,979. Noted July 10.

Ill., Rock Island—LEVEE—U. S. Eng., setback levee in Iowa River Flint Creek Levee Dist., to W. Sillick, D. B. A. Wapello Constr. Co., Wapello, Ia.

Ky., Outwood—ROADS—Vet. Bur., constructing, resurfacing roads at U. S. Veteran's Hospital, to Samford Bros., Montgomery, Ala., $70,000. Noted May 15.

Mass., Camp Devens—POST HOSPITAL—Con. Q. M., constructing U. S. Veteran's Hospital, to Shawmut Constr. Co., 294 Washington St., Boston, $115,284. Noted July 10.

Mass., Lowell—POST OFFICE—Treas. Dpt. at office Sup. Archt., post office, to F. A. Meloy, Lowell, $349,500. Noted July 10.

Minn., South St. Paul—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to Madsen Constr. Co., 618 Natl. Bldg., Minneapolis. Est. $125,000. Noted May 29.

N. Y., Northport—ELEVATORS—Vet. Bu., elevators for U. S. Veterans Hospital, to Haughton Elevator & Machine Co., Vermont Bldg., Wash., D. C., $12,383. Noted July 10.

Oregon—ROAD—W. L. Lynch, dist. engr., P. O. Bldg., Portland, grading 4.03 mi. National Forest Rd., Lincoln Co., to Yunker Wiecks Co., Corvallis, $51,586.

Va., Richmond—EXTENSION—Treas. Dpt. at office Sup. Archt., remodeling, enlarging post office, to National Constr. Co., Glenn Bldg., Atlanta, Ga., $778,000. Noted June 19.

Washington—ROAD—W. L. Lynch, dist. engr., Post Office Bldg., Portland, Ore., grading, surfacing 10.3 mi. White River Rd. Mount Rainier Natl. Park, 20 ft., to A. C. Goerig, Seattle, $99,035.

Wyo., Sheridan—RECREATION BUILDING—Vet. Bur., recreation building at U. S. Veteran's Hospital, to W. MacDonald Constr. Co., Syndicate Trust Bldg., St. Louis, Mo., $59,164. Noted May 29.

T. H., Schofield—BARRACKS—Con. Q. M., 3 barracks, 1 administration building, to J. L. Young Eng. Co., Honolulu, $776,500. Noted May 22.

RAILWAYS

PROPOSED WORK

Pennsylvania—Monessen South Western R.R. Co., subsidiary Pittsburgh Steel Co., soon lets contract 2.5 mi. track, connecting Monessen South Western R.R. lines with Pittsburgh & West Virginia Cochran Mills—Conlsvl. ext., $200,000. J. G. Parke, Monessen, engr.

CONTRACTS AWARDED

New York—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, altering railroad structure to permit widening roadway, Lexington Ave. between 72nd and 86th Sts., in New York, to Poirier & McLane Co., 33 West 42nd St., New York, $226,210. Noted July 3.

SUBWAYS AND TUNNELS

PROPOSED WORK

Ont., Sudbury — Constructing 42 ft. subway under Canadian Pacific Ry. tracks at Elm St. $120,000. F. Barber, 45 Jarvis St., Toronto, engr.

CONTRACTS AWARDED

Ont., Concord—T. T. Irving, ch. engr. Canadian Natl. Ry., New Union Sta., Toronto, concrete, steel subway under Canadian Natl. Ry., to Johnson Bros. Ltd., 43½ Market St., Brantford. Est. $35,000. Noted May 29.

GRADE CROSSINGS

PROPOSED WORK

N. Y., Nelliston — State, Albany and New York Central R.R., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, reconstructing River Street Bridge, 178 ft. long, 24 ft. roadway, two 5 ft. sidewalks, $90,000.

O., Cleveland—City, Cuyahoga Co. and Cleveland, Cincinnati, Chicago & St. Louis R.R. Co., H. Baldwin, ch. engr., Big Four Bldg., Cincinnati, preliminary plans eliminating grade crossing over Big Four Tracks at West 130th St. $500,000. A. M. Felgate, Court House, co. bridge engr.

CONTRACTS AWARDED

Mass., Lawrence—Boston & Maine R.R. Co., Lechemere Sq., Cambridge, general contract railroad underpass, to Lathrop & Shea Co., 178 Goffe St., New Haven, Conn.; excavating, to L. C. Cyr, 45 Melrose St., Est. exceeds $25,000.

DAMS

PROPOSED WORK

Calif., Santa Ana—See "Waterworks."

Conn., Terryville—See "Power Plants."

CONTRACTS AWARDED

Ill., Effingham—Central Illinois Pub. Serv. Co., 1306 South 6th St., Springfield, 400 ft. earth, concrete dam, 15 ft. across top, 200 ft. wide at base, 35 ft. high, 100 ft. concrete spillway, 30 ft. wide; concrete tower, 35 ft. high, with one 16 ft. and two 12 ft. flood gates, to C. J. Moritz, Inc., Parker Bldg. Est. $100,000-$150,000.

Alta., Calgary — City Clerk, constructing Glenmore Reservoir Dam in connection with waterworks extension, to Bennett & White Constr. Co., Calgary, $781,210. Noted July 10 under "Waterworks."

PIERS AND WHARVES

PROPOSED WORK

Calif., San Francisco — PIERS — California State Bd. Harbor Comn., preliminary plans replacing Piers 5, 7, 9 and 11. $750,000 each. F. G. White, Ferry Bldg., engr.

BIDS ASKED

N. B., Caraquet—WHARF—Aug. 1, by N. Desjardins, secy. Dpt. P. Wks., Ottawa, Ont., extending wharf, $10,000.

Ont., Kincardine—PIER—Aug. 1, by N. Desjardins, secy. Dpt. P. Wks., Ottawa, Ont., reconstructing North Pier, 200 ft. high. $30,000.

Ont., Kingsville — PIER — Aug. 1, by N. Desjardins, secy. Dpt. P. Wks., Ottawa, repairing East Pier. $30,000.

Que., Isle aux Grues—WHARF—Aug. 5, by N. Desjardins, secy. Dpt. P. Wks., Ottawa, Ont., extending wharf, $22,500.

CONTRACTS AWARDED

P. E. I., Point Prim — WHARF — Dpt. P. Wks., Ottawa, Ont., reconstructing wharf, to D. A. MacDonald, Charlottetown, $11,211.

AIRPORTS

PROPOSED WORK

Ark., Marianna—Chamber of Commerce, c/o G. B. Cutting, secy., preliminary plans airport, tourists camp, swimming pool, tennis courts, $25,000.

BIDS ASKED

Conn., Bristol—Bristol Airports, Inc., Stevenson Field, taking bids grading, constructing 1,200 ft. and 700 ft. runways, each 500 ft. wide. Sperry & Buel, Inc., 175 Main St., engrs.

CONTRACTS AWARDED

Minn., Duluth — J. Wilson, city engr., 85 x 120 ft. hangar and machine shop addition, Williamson-Johnson Municipal Airport, to A. Hedenberg & Co., 4611 Gladstone St., $42,842. Noted June 26.

GRAIN ELEVATORS

PROPOSED WORK

Ia., Council Bluffs — GRAIN ELEVATOR — Chicago, Burlington & Quincy R.R. Co., 547 Jackson Blvd., Chicago, Ill., A. W. Newton, ch. engr., grain elevator addition, incl. ten grain storage tanks, 125,000 bu. capacity, new work house, $125,000. N. T. Krausch, 547 West Jackson Blvd., Chicago, Ill., archt.

CONTRACTS AWARDED

Neb., Gibson — GRAIN ELEVATOR — Nebraska-Iowa Grain Co., J. H. Wright, pres., grain elevator, rein.-con., Chicago, Burlington & Quincy R.R., to Burrell Eng. & Constr. Co., 1 North Canal St., Chicago, Ill. Est. $40,000. Noted July 10.

Tex., Sherman—GRAIN ELEVATOR—G. B. R. Smith Milling Co., c/o J. P. Smith, 300,000 bu. grain elevator addition, to Jones-Hettlesater Co., 600 Mutual Bldg., Kansas City, Mo., $50,000.

Ont., Kingston — GRAIN ELEVATOR — Canadian Terminal Systems Ltd., Canadian Pacific R.R. Bldg., Toronto, 2,500,000 bu. grain elevator on Cataraqui Bay, to Barnett-McQueen Co. Ltd., Christian St., Fort William. Est. $500,000.

POWER AND LIGHTING

PROPOSED WORK

Ontario—Hydro Electric Power Comn. of Ontario, 190 University Ave., Toronto, F. A. Gaby, ch. engr., 12 mi. rural power lines in Elmvale Dist., 13 mi. in Kempenfeldt Bay area, 7 mi. in Utterson Dist., 49 mi. in Hawkestone, Ripley, Thornton and Midland area. $150,000 up.

BIDS ASKED

Ind., Indianapolis—Aug. 11, by Bd. Health, H. S. Leonard, pres., electric wiring, fixtures in new laundry; alterations, additions to electric light, power and signal systems, new motor generator sets in certain buildings now in use so as to adapt them for connection to new light and power plant. C. R. Ammerman, 925 Continental Bank Bldg., engr.

Texas—See "Contracts Awarded."

CONTRACTS AWARDED

Mass., North Reading — Commonwealth of Massachusetts, State House, Boston, heating and ventilating remodeled power house at state sanitarium, to Acme Heating & Venting Co., 13 Hawkins St., Boston, $18,745. Est. $25,000.

Pa., Phila.—Dpt. City Transit, C. E. Myers, dir., City Hall Annex, fire alarm and police signal cables, underground pedestrain concourse Broad St., Subway, Contr. 31, to Standard Underground Cable Co., 18 Washington St., Pittsburgh.

Texas—Gulf State Utilities Co., 362 Liberty St., Beaumont, 10 mi. 13 kv. transmission line between Anahuac and Hankamer, day labor under supervision of owners; materials contract, awarded to Stone & Webster Eng. Co., engrs., 164 Bway., Boston, Mass., and Beaumont.

SPORTS AND PARKS

PROPOSED WORK

Ark., Marianna—See "Airports."

Conn., Fairfield — Colony Club preliminary plans 100 x 200 ft., concrete swimming pool, 40 x 110 ft. timber clubhouse, 9-hole golf course, tennis courts, stables, pump house, fountains. To exceed $25,000. G. G. Hyde, 58 State St., engr.

Mass., Brockton—I. Richmond, archt., 248 Boylston St., Boston, soon lets contract 2 story, brick, stone gymnasium, incl. concrete swimming pool, bowling alleys, handball court, lockers, for Y. M. H. A. and Y. W. H. A. Community Centre, 66 Green St. To exceed $40,000. Noted June 5.

Mass., Brookline (br. Boston)—Northern University, J. Stevens in charge, 316 Huntington Ave., Boston, receiving preliminary estimates 1 story, brick locker building, field house, Kent St. $25,000 or more. Ripley & LeBoutillier, 45 Bromfield St., Boston, archts.

Miss., Laurel—City, M. W. McLaughlin, mayor, contract for preliminary work stadium, incl. removing 2,000 cu.ft. dirt, constructing 900 lin.-ft. retaining wall, laying 600 lin.ft. pipe, to L. A. Gilly.

N. Y., Lake Placid—Plans bob sled run for Olympic Games. Smith Golder & Homburger, Saranac Lake, engrs.

BIDS ASKED

Mass., Boston—Aug. 7, by City Park Dpt., 33 Beacon St., 1 story, brick, concrete field house at Webster Avenue Playground, $25,000.

N. J., Nutley—M. A. Wolf, archt., 845 Broad St., Newark, bids about Aug. 1, general contract amusement park, grading, sodding, walks, driveways, 2 swimming pools, service station, concession booths, for Harrison Park Impvt. Co., 24 Branford Pl., Newark, $150,000. Noted July 17.

N. Y., Babylon—Aug. 12, by Long Island State Park Comn., Administration Headquarters, Belmont Lake State Park, bath house, swimming pool, restaurant, administration building and walks at Jones Beach State Park. A. E. Howland, ch. engr.; adv. E. N.-R. July 31.

N. Y., Batavia—Aug. 21, by Superintendent Div. Standards & Purchase, Executive Dpt., Capitol, Albany, completing swimming pool, New York State School for Blind; adv. E. N.-R. July 31.

N. Y., New York—Aug. 5, by J. Miller, pres. Manhattan Boro, Municipal Bldg., general contract erecting, completing natatorium, comfort station, indoor playground, roof garden in Hudson Park, adjoining the Public Bath Building 83 Carmine St. Former bids rejected. Noted July 3.

Sports and Parks (Continued)

Tex., LaFeria—Valley Memorial Park Assn., c/o A. F. Parker, pres., taking bids Memorial Park Development, incl. permanent driveways, 900 lin.ft. concrete and iron fence, sunken gardens and pond, drainage system, sprinkling system, administration building. $150,000. S. W. Allen, Mercedes, consult. engr. Baker Potts, LaFeria, landscape engr. R. N. Waters, Weslco, archt.

CONTRACTS AWARDED

Mass., Boston—Dpt. School Buildings, playground shelters at various schools, to P. J. Cantwell, 6 Dakota St., Dorchester, $18,470; Est. $25,000. Noted July 10.

Mass., Malden (br. Boston) — City, School Field Com., steel bleachers at High School Field, to N. E. Structural Steel Co., 38 Chauncy St., Boston. Est. $30,000. Noted July 17.

N. Y., New York—Park Dpt., Arsenal Bldg., Central Park, recreational building at McCombs Dam Park, to Dietz Fallert Constr. Co., 26 Court St., Brooklyn, $76,800. Noted July 3.

N. Y., New York—Park Bd., W. R. Herrick, pres., Park Dpt., Arsenal Bldg., Central Park, lockers in Central Park, to Lyon Metal Products Co., 342 Madison Ave. $7,232; pipe fence in Riverside Park, to Walthaw Corp., 1860 Bway., $3,797; sheet asphalt paving parks and roadways, to Brusstar Constr. Co., Harlem River and 150th St., $18,999; benches in Madison Sq. Park, to Booth Constr. Co., Inc., 125 Court St., Brooklyn, $19,747—Ewen Park improvements, to T. DiRoma, 33 Evelyn Pl., $18,135. Grand total $67,910. Noted June 26.

O., Cleveland—City, D. Morgan, city mgr., pile foundations for Lakefront Stadium, to Frederick Snare Corp., 114 Liberty St., New York, $195,592; furnishing steel for superstructure, to American Bridge Co., Ambridge, Pa., $281,840; erecting same, to Bass Constr. Co., 2100 Lakeside Ave., $73,080. Grand total $550,512. Noted July 3.

Okla., Stillwater—Stadium Corp., c/o L. W. Burton, Stillwater, rein.-con., steel stadium, addition, to Kreipke Constr. Co., 706 West Grand Ave., Oklahoma City. Est. $25,000.

HEATING AND VENTILATING

BIDS ASKED

Mass., Boston — Aug. 5, by Hospital Dpt., heating, ventilating, plumbing in South Dpt., Boston City Hospital, Harrison Ave. $25,000 or more. Private plans.

Mass., Cambridge—Aug. 4, by City School Com., City Hall, heating, electric wiring in various schools. To exceed $25,000. Private plans.

CONTRACTS AWARDED

Ky., Bowling Green—Western Kentucky State Teachers College, H. H. Cherry, pres., 400 hp. boiler and equipment, to H. Netherton & Co., 114 North 5th St., Louisville, $17,042.

Wis., Beloit—Union School Dist. 2, heating and ventilating for Burdge School, to Osborn & Klingbera, Beloit, $11,294.

UNCLASSIFIED

PROPOSED WORK

Oklahoma, Iowa, Illinois, Minnesota, Nebraska and Wisconsin—PIPE LINES—Barnsdall Corp., Barnsdall, Okla., and Continental Oil Co., Continental Oil Bldg., Denver, Colo., have formed the Great Lake Pipe Line Co. and plans 1,400 mi. 8 in. gas pipe line from Barnsdall, Okla. to Des Moines, Ia., 6 in. branch line from Des Moines, Ia. to Chicago, Ill., 4 in. line from Des Moines, Ia. to St. Paul, Minn., 4 in. branch from Des Moines to Council Bluffs, Ia., and Omaha, Neb., 4 in. line from Chicago, Ill. to Milwaukee, Wis. $12,000,000.

Okla., Seminole—GAS STATION—Cities Service Gas Co., Bartlesville, 4,000 h.p. natural gas compressor station on gas pipe line near here. $150,000. Private plans.

Pa., Edgewood—CULVERT—Boro plans 800 ft. culvert over branch Nine Mill Run. D. C. Neal, Edgewood, engr.

Pa., Hazelwood—PILE DOCK—Baltimore & Ohio R.R. Co., Baltimore, Md., H. A. Lane, ch. engr., pile dock-dumping bins through which coal may be dropped from hopper cars to conveying bel tand carried to barges. $100,000. A. C. Clark Co., Maloney Bldg., Pittsburgh, engrs.

Pa., Saxonburg—TRANSMITTER STATION—Westinghouse Electric & Mfg. Co., East Pittsburgh, plans by B. H. Prack, Martin Bldg., 400,000 watt output addition to KDKA transmitter station. $175,000. Private plans.

Ont., Fort William — GAS and COKING PLANT — Fort William Gas Co., subsidiary Canadian Terminal Systems Ltd., H. I. Price, genl. mgr., 1106 Canadian Pacific Ry. Bldg., Toronto, 6 buildings, gas and coking plant, Riverfront. $1,000,000. H. A. Johnston, c/o owner, engr.

BIDS ASKED

Conn., Hartford—DIKES—Aug. 19, by City, constructing dike in South Meadows, $600,000. Total $1,500,000. R. N. Clark, City Hall, engr.

Ill., Peoria—RIVER and RAIL TERMINALS—Aug. 19, at office W. E. Moran, city clk., Peoria River and Rail Terminals. J. A. Harmon, Inc., 904 Jeerson Bldg., engrs.; adv. E. N.-R. July 31.

Mass., Boston—BRICK WORK—Aug. 4, by Dpt. School Buildings, City Hall, brickwork about boilers in various schools, one or separate bids for Sects. A-B-C and D. $25,000.

N. Y., Auburn—FENCE—Aug. 12, at office Dpt. Correction, State Office Bldg., Albany, fence at Auburn Prison. R. F. C. Kieb, comr.; adv. E. N.-R. July 31.

N. Y., Industry—BARN and SILOS—Aug. 21, by Superintendent Div. Standards & Purchase, Executive Dpt., Capitol, Albany, barn, 2 silos and masonry work, at State Agricultural & Industrial School; adv. E. N.-R. July 31.

Ont., Gore Bay—PUBLIC BUILDING—Aug. 1, by N. Desjardins, secy. Dpt. P. Wks., Ottawa, public building. $25,000.

CONTRACTS AWARDED

Conn., Danielson—REPEATER STATION—American T. & T. Co., 195 Bway., New York, 1 story, basement, 65 x 84 ft., concrete, brick, **steel telephone** repeater station, to H. U. Bail Estate, 44 Goddard St., Southbridge. Est. $80,000.

Conn., Hartford—TEST BORINGS—State Hy. Comn., Hartford, test borings for bridge over Connecticut River, Dutch Point, to Kennedy & Riegger Drilling Co., 30 Church St., New York.

Mass., Quincy—COKE STORAGE and SCALE HOUSE—New England Fuel & Transportation Co., 250 Stuart St., Boston, 1 story, brick coke storage scale house, 6 concrete silos, 90 ft. high, Centre St., to Rust Eng. Co., Koppers Bldg., Pittsburgh, Pa. Est. exceeds $25,000.

O., Cleveland — BULKHEAD — Bulkhead at Kirtland Pumping Station, to C. H. Strong & Son and L. A. Wells Constr. Co., 30 Euclid Arcade, $352,327.

O., Columbus—SHEDS, etc.—Union Station Co., steel, timber train sheds, 800 ft. long, relaying tracks at union station, West High St., to Fritz-Rumer-Cooke Constr. Co., 2098 South High St., $175,000.

Pa., Pittsburgh — STOCK YARD — Pennsylvania R.R., Broad St. Sta., Phila., altering stock yard building, Herrs Is., to John F. Casey Co., Freeport Rd., Aspinwall. Est. $50,000.

Tex., Fort Worth—ELEVATORS—Texas & Pacific Ry. Co., installing 5 passenger and 1 freight elevators in 12 story office building and 1 passenger, 11 freight elevators in 8 story freight building, to American Elevator & Machine Co., 500 East Main St., Louisville, Ky., $300,000.

Utah, Milford—RELAY STATION—American Telephone & Telegraph Co., 931 14th St., Denver, Colo., relay station, to Fullmer Bros., Salt Lake City, $60,000.

Wyo., Yellowstone Natl. Park—FILLING STATION—C. A. Hamilton, Old Faithful Inn, 1½ story, 30 x 30 ft. at Old Faithful Geyser, **also** similar filling station at Lake Hotel, to Rassmussen & Brown, Bozeman, Mont., $25,000 and $15,000 respectively.

B. C., Vancouver—FIRE ALARM—City, gamewell system, incl. all equipment for fire alarm central office, engine house, underground and aerial cable, to Northern Electric Co. Ltd., 150 Robson St., $189,200.

Ont., Port Arthur—STORAGE TANKS—J. A. Richardson & Sons, eighty 100 ft. high concrete grain storage tanks, to Barnett McQueen Co., Cuthbertson Blk., Fort William, $750,000.

Ont., Sudbury—TELEGRAPH RELAY STATION—Canadian Pacific Ry., Windsor Sta., Montreal, Que., 3 story, basement, 60 x 100 ft., concrete, brick addition, to Duncan Constr. Co., Cedar St. Est. $50,000.

MATERIALS

BIDS ASKED

PIPE—**Bloomfield, Ind.**—Aug. 5, by Comrs. Green Co. sewer pipe. $5,000. G. R. Hudson, Bloomfield, aud.

ASPHALT—**Wabash, Ind.**—Aug. 5, by Comrs. Wabash Co., 13,000 gal. cut back asphalt, $5,000. Q. A. Caver, Wabash, aud.

DOUGLAS FIR and LONG LEAF YELLOW PINE—**Boston, Mass.**—Aug. 4, by Transit Dpt., T. F. Sullivan, comr., 1 Beacon St., Douglas fir and long leaf yellow pine as specified. $5,000 or more.

TRAFFIC SIGNS—**Boston, Mass.**—Aug. 7, by Dpt. Supplies, P. A. Chapman, supt., traffic signs for Boston Traffic Comn., as specified. $5,000.

TAR, etc.—**Dutch Neck, N. J.**—Aug. 2, by West Windsor Twp. Com., 7,510 gal. tar "B light"; 6,570 gal. A or U-2 tar; 240 tons pea gravel; 140 tons sand. H. Cook, twp. clk. C. S. Sincerbeaux, Mechanic Bldg., Trenton, engr.

MASONS MATERIALS—**Jersey City, N. J.**—Aug. 5, by Bd. City Comrs., City Hall, sand, cement, brick, other masons materials as needed from date of contract to Dec. 31, 1930. J. Henderson, city engr.

LUMBER—**Skillman, N. J.**—Aug. 8, by State Purchasing Agent, State House, Trenton, lumber. $5,000.

STEEL—**Phila., Pa.**—Aug. 5, by C. E. Walsh, purch. agt. Pennsylvania R.R., 15 North 32nd St., structural steel, Contr. 22-1930.

CONTRACTS AWARDED

PORTLAND CEMENT — **Long Island City, N. Y.** — G. U. Harvey, pres. Queens Boro, Boro Hall, 3,000 bags portland cement, to General Builders Supply Co., 205 East 42nd St., New York, $1,560; 225,000 gal. fuel oil, from Burns Bros., $9,000; 20,000 cu.yd. sand, to Emmett B. Simpson, Inc., Lawrence St., Flushing $21,800; 100,000 gal. gasoline, to Warner Quinlan Co., 2 Park Ave., New York. $41,760. Noted **July 10.**

GASOLINE, etc.—**New York, N. Y.**—J. Miller, pres. Manhattan Boro, Boro Hall, 80,000 gal. gasoline, to Utility Oil Corp., 2 Park Ave., $7,520; 15,000 gal. furnace oil, to Standard Oil Co. of New York, $1,425—3,500 cu.yd. paving sand, to Colonial Sand & Stone Co., 551 5th Ave., $7,350; 700,000 gal. asphaltic cement, to Colonial Beacon Oil Co., Inc., 420 Lexington Ave., $38,850; 20,000 bags portland cement, to C. E. McCarty, $10,200. Grand total $65,345. Noted July 10.

EQUIPMENT

PROPOSED WORK

TRUCK—**Beverly Hills, Calif.**—City purchasing 2.5 tons motor truck, for Street Dpt.

SHOVEL and TRACTOR—**El Centro, Calif.**—Bd. Supervs. Imperial Co. purchasing ⅜ to ½ yd. gasoline shovel and caterpillar tractor.

BIDS ASKED

DRAW TRUCKS—**Boston, Mass.**—Aug. 5, by Dpt. P. Wks., J. A. Rourke, comr., City Hall, draw trucks at Summer Street Bridge, overhaul and refit.

TRACTOR—**Mantorville, Minn.**—Aug. 19 (extended date), by G. L. Taylor, aud. Dodge Co., one 20 to 30 hp. wheel-type tractor. Noted July 10.

MECHANICAL EQUIPMENT, etc. — **Jersey City, N. J.**—Aug. 8, by Bd. City Comrs., City Hall, mechanical equipment, boilers in power house of Jersey City Hospital. Former bids rejected. J. T. Rowland, 30 Journal Sq., engr.

BOILERS, etc.—**Skillman, N. J.**—Dpt. Institutions & Agencies, State Office Bldg., Trenton, new bids about Aug. 1, boilers, stokers, smoke stack, coal and ash handling equipment, steam line conduits for hospital, at state Village for Epileptics. $25,000. C. N. Leathem (Div. Architecture & Constr.) Trenton, engr.

Buildings

RESIDENTIAL

BIDS ASKED

N. J., Jersey City—See "Contracts Awarded."

CONTRACTS AWARDED

N. J., Jersey City—Meltzer Bros., 1022 Hudson Blvd., Bayonne, 4 story, basement, 50 x 100 ft., brick, steel, 134-36 Corbin Ave., separate contracts. $150,000. C. I. Goldberg, 921 Bergen Ave., archt.

N. Y., New York—Chanin Constr. Co., 122 East 42nd St., 7,000 tons steel for Majestic Apartments, 29 story, 187 x 204 x 225 ft., to Hay Fdry. & Iron Wks., 15 East 26th St. Noted June 19.

O., Cleveland — G. Bellin, c/o L. Skolnik, archt., Auditorium-Garage Bldg., masonry contract for 4 story, basement, brick, 17300 Euclid Ave., to Winikur Bros., 10613 Lee Rd. Total est. $150,000.

Tenn., Chattanooga—N. J. Manning Patton Estate, 7 story, 23 x 105 x 114 ft., rein.-con., brick, stone, plain found., **Georgia** Ave. and 9th St., to Orr-Barnes Co., Volunteer Life Insurance Bldg., $138,000.

CLUBS

PROPOSED WORK

Conn., Fairfield—See "Sports and Parks."

Ia., Waterloo—Y.M.C.A., S. A. Cohagen, genl. secy., plans by M. B. Cleveland, 424 East 4th St., rein.-con., brick, stone, West 4th St. $400,000.

Kan., Manhattan—W. J. Russell, 117 West 6th St., Topeka, soon lets contract 3 story, basement, 90 x 130 ft., rein.-con., brick addition, incl. 300 seating capacity chapel, for Rebecca & Odd Fellows Lodge, c/o G. Hughes, Eldorado. Rose & Ridgway, 434 Brotherhood Bldg., Kansas City, archts. Noted Oct. 3.

O., Cincinnati—Kenwood Country Club, c/o J. Hoff, 8th and Race Sts., plans by J. C. Grunkemeyer, Eastern Ave., 2 story, basement, 100 x 200 ft., brick, concrete plain found., Madisonville Rd. $150,000.

Ont., Peterborough—Y. M. C. A., 475 George St., plans by W. R. L. Blackwell, Bank of Commerce Bldg., and soon takes bids 3 story, basement, 50 x 100 ft., concrete, steel addition, also 25 x 60 ft. swimming pool. $150,000. Noted May 29.

BIDS ASKED

N. J., Perth Amboy—E. Wierzbicki, archt., 175 Smith St., bids about Sept. 2, general contract 3 story, basement, brick, steel, plain found., Elm St., for Fourth Ward Polish Citizens Club, c/o architect. Noted June 27.

CONTRACTS AWARDED

Conn., Danbury—B. P. O. E. 120, 327 Main St., 3 story, basement, brick, plain found., 345 Main St., to L. F. Sweeney, 15 Bates Pl. Est. $150,000. Noted June 19.

HOSPITALS

PROPOSED WORK

Kan., El Dorado—S. B. Allen Memorial Assn., 3 story, basement, 42 x 122 ft., rein.-con., brick, bids in September, Washburn & Stokey, Ottawa, archts. $150,000.

Hospitals (Continued)

Md., Sparrows Point (br. Baltimore)—Bethlehem Steel Co., Sparrows Point, Md., or Bethlehem, Pa., soon lets contract 1 story, basement, irregular sized, brick, cinder block, limestone hospital. Bissell & Sinkler, 1520 Locust St., Phila., Pa., archts. Noted May 15.

Mass., Harwich—Central Cape Hospital Trust, C. T. Chase, pres., altering and constructing additions at hospital. $150,000 or more.

Mass., Danvers — Commonwealth of Massachusetts, Dpt. Mental Diseases, Boston, soon takes bids altering Danvers State Hospital, 3 story, basement, brick. $300,000. M. P. Meade, 80 Boylston St., Boston, archt. Noted Feb. 21.

Mass., Dartmouth—Sol-E-Mar Hospital, Inc., A. M. Jones, 396 County St., soon takes bids altering and constructing 2 story, basement, brick, stone hospital, Dartmouth St. $150,000 or more. W. Tallman, 222 Union St., New Bedford, archt.

Mich., Wyandotte—E. C. Bryan, city clk., soon lets contract 4 story, basement, rein.-con., brick, steel, stone nurses home, for Wyandotte General Hospital. $200,000. D. J. V. Snyder, 939 Penobscot Bldg., Detroit, archt. Noted July 17.

Mont., Missoula — Northern Pacific Ry. Beneficial Assn., W. A. Laidlaw, secy., Railroad Bldg., St. Paul, Minn., plans by L. Bassindale, 485 Endicott Bldg., St. Paul, Minn., 4 story, basement, rein.-con., brick hospital addition. $150,000.

N. J., Jersey City—Bd. City Comrs., City Hall, sketches by J. T. Rowland, 30 Journal Sq., 3 story, basement, brick, steel hospital, power house additions, Montgomery and Baldwin Sts. $150,000. Noted June 5.

N. J., Secaucus—Bd. Freeholders Hudson Co., Court House, Jersey City, sketches by J. T. Rowland, 30 Journal Sq., Jersey City, 4 story, basement, brick, steel hospital. $400,000.

N. J., Valley View—Bd. Freeholders Passaic Co., Court House, Paterson, preventorium. $500,000. Engineer and architect not selected.

O., Cincinnati—Western Hills Hospital Assn., c/o G. W. Drach, archt., Union Trust Bldg., 4 story, basement, rein.-con., brick, plain found., Glenway St. $300,000.

O., Cleveland—City, D. S. Blossom, dir., plans by H. Kregelius, 504 City Hall, tuberculosis hospital at city hospital group, $1,075,000; tuberculosis hospital at Warrensville Farm, $500,000; chronic hospital, at city infirmary, $1,750,000; 8 cottages at Hudson Farm, $480,000; boys school, $205,000; service and superintendent's cottage, $225,000. Election Nov. 4 to vote on bond issue for same. Noted Oct. 17.

BIDS ASKED

Md., Baltimore—Aug. 6, by Bd. Awards, City Hall, 10 story, T-shaped, brick, concrete, steel, hollow tile nurses home, 4940 Eastern Ave. $450,000. V. R. P. Saxe, 217 North Calvert St., engr. Palmer & Lamdin, 513 North Charles St., archts. Noted Mar 6.

Mass., Roxbury (br. Boston)—Aug. 1, by Childrens Hospital, G. Von L. Myer, chn. building com., 53 State St., Boston, 2 and 3 story, basement, irregular shaped, brick, steel contagious hospital unit, plain found., Vila St. To exceed $150,000. Coolidge, Shepley, Bulfinch & Abbott, Ames Bldg., Boston, archts.

Mass., Springfield — Aug. 6, by Springfield Hospital, 759 Chestnut St., and Stevens & Lee, archts., 45 Newbury St., Boston, 7 and 2 story, basement, brick, steel, limestone addition and service building, North Chestnut and Springfield Sts. $1,000,000. Noted July 3.

Mo., Independence—See "Contracts Awarded."

Okla., Norman—Aug. 5, by Bd. Affairs, Capitol Bldg., Oklahoma City, 2 story, basement, 86 x 90 x 190 ft., rein.-con., brick ward building, plain found., on campus. $150,000. Layotn, Hicks & Forsyth, Braniff Bldg., Oklahoma City, engrs. Noted June 26.

Ont., London—Dpt. Wks., F. R. Heakes, ch. archt., Parliament Bldgs., bids about Aug. 1, storehouse at Ontario Hospital. G. Hogarth, deputy minister P. Wks.

CONTRACTS AWARDED

Ariz., Phoenix—Fitzhugh & Byron, archts., Home Builders Bldg., 70 x 200 ft. medical clinic known as Lois Grunow Memorial Clinic, to T. L. Weatherford, 110 North 1st Ave., $250,000. Noted June 26. Plumbing, to D. S. Horrall Plumbing Co.; heating and ventilating, to Southwestern Mfg. & Supply Co., both in Phoenix.

Calif., Redwood City—E. M. Kneese, clk. San Mateo Co., general contract 3 story, rein.-con. hospital annex, to Sorenson & Haggmark, 2652 Harrison St., San Francisco; electrical work, to Atlas Electric Co., San Mateo; heating and ventilating, to F. J. Klimm, Inc., 456 Ellis St., San Francisco, for San Mateo Co. Hospital. Noted June 19.

Mass., Wellesley (br. Boston) — Childrens Convalescent Hospital Home, Forest St., 2 story, basement, brick, steel isolation unit at Convalescent Home, to R. L. MacPhail, 30 Falkner Ter., Brighton. Est. $150,000. Noted July 17.

Mo., Independence — H. C. Smith, archt., Auditorium Bldg., 7 story, basement, 34 x 165 ft., rein.-con., brick, sanitarium, West Van Horn Rd., separate contracts, for Independence Sanitarium, c/o G. E. Copeland, bus. engr. $400,000. Architect taking bids now on submaterials. Noted July 24.

N. J., Asbury Park — Morris & Erskine, archts., 1716 Chestnut St., Phila., Pa., general contract 5 story, basement, brick, steel hospital, nurses home, boiler house, to Walter Kidde & Co., 140 Cedar St., New York, for Ann May Fitkin Hospitals. Est. $1,100,000. Noted July 24.

N. Y., Utica—Faxton Hospital, hospital addition, to H. R. Beebe Co., 414 Court St., $350,000; plumbing to W. T. Cantwell, 306 Bleecher St.; heating, to H. J. Brandeles Corp., 1602 Lincoln Ave. Noted Apr. 3.

R. I., Cumberland—Trappist Monks of the Cistercian Monastery of Our Lady of the Valley, J. O'Connor, pastor, 1 and 3 story, basement, brick, infirmary and porter lodge, Diamond Hill Rd. $150,000 or more. Owner builds. A. J. Murphy, 25 Fenner St., Providence, archt.

Ont., Fort Erie—W. L. Somerville, archt., 2 Bloor St. W., Toronto, general contract 3 story, basement, rein.-con., brick, stone, for Memorial Hospital, to Gardiner Constr. Co. Ltd., 22 Cross St., Welland; plumbing and heating, to Sheppard & Abbot, 119 Harbord St., Toronto. Est. $200,000. Noted June 19.

Ont., North Bay—Sisterhood of St. Joseph, 384 Rogers St., Peterborough, general contract 5 story, basement, concrete, brick, steel, stone, to J. J. Fitzpatrick, 127 Church St., Sault Ste. Marie. Est. $300,000.

Que., Montreal — Petites Francis Caines de Marie, 90 x 116 ft. hospital, De St. Valier St., to Concrete Constr. Co., 1082 Decarie Blvd., $170,000.

CHURCHES

PROPOSED WORK

Conn., Middletown—First Methodist Episcopal Church, M. J. Creeger, pastor, plans by Woodbury & Stuart, 581 Boylston St., Boston, Mass., 1 story, basement, brick, stone. $160,000.

N. H., Nashua—Infant Jesus Parish, I. A. Janella, pastor, and W. E. Provost, archt., 1061 Elm St., Manchester, soon lets contract 2 story, basement, brick, stone, granite church, school, plain found., Crown St. $150,000. Noted July 10.

N. J., Preakness — Preakness Reformed Church sketches by F. W. Wentworth, 140 Market St., Paterson, rebuilding 2 story, basement, brick, steel. $150,000.

BIDS ASKED

Mass., Arlington — Aug. 1, by St. James Parish, M. J. O'Connor, pastor, 1 story, basement, brick, granite, plain found., Appleton St. $150,000-$160,000. W. B. Colleary, 80 Boylston St., Boston, archt. Noted June 26.

Mass., Grafton — Aug. 1, by Dpt. Mental Diseases, 1 and 2 story, basement, brick, stone, steel chapel, recreation building, plain found., at State Hospital. $150,000. W. T. Littlefield, 9 Hamilton Pl., Boston, archt.

N. J., Arlington—Myers & Shanley, archts., 24 Walnut St., Newark, bids about Sept. 2, general contract 2 story, basement, brick, steel seminary, for Immaculate Conception Seminary. $150,000. Noted July 24.

N. J., Irvington (br. Newark)—N. Hulme, archt., 1524 Chestnut St., Phila., Pa., bids about Sept. 2, general contract 2 story, basement, brick, steel, plain found., for Methodist Episcopal Church, R. L. Luerich, pastor, 64 Myrtle Ave. $150,000. Noted July 10.

N. J., Jersey City — Monumental Baptist Church, W. S. Smith, pastor, 18 Atlantic St., and J. Armstrong, archt., 36 Gautier Ave., bids about Sept. 2, general contract 3 story, basement, brick, steel, Atlantic St. $150,000. Noted July 24.

CONTRACTS AWARDED

Ind., South Beach — New Apostolic Church, general contract brick, steel, tile, terra cotta, to Platz & Gill, 1125 South Main St. Est. $150,000. Noted June 19.

N. J., Cranford—Poggi & Bragdon, archts., 275 Morris Ave., Elizabeth, general contract altering and constructing 2 story, basement, brick, steel convent addition, to H. Montague & Sons, Inc., 15 Exchange Pl., Jersey City, for St. Michael's Church, c/o architect. Noted June 26.

N. J., Ventnor (br. Atlantic City) — N. Hulme, archt., 1524 Chestnut St., Phila., Pa., general contract, 2 story, basement, brick, steel, to H. Mathis, 120 Atlantic Ave., Atlantic City, for Protestant Episcopal Church of Epiphany, F. Lightfoot, pastor. Est. $150,000. Noted May 29.

Pa., Brookline (Pittsburgh P. O.)—Church of Resurrection, R. Canevin, pastor, 1201 Chelton Ave., stone, 1039-13 Chelton Ave. $250,000. Owner builds. W. P. Hutchins, Empire Bldg., Pittsburgh, archt.

SCHOOLS

PROPOSED WORK

Ill., Chicago—Bd. Educ. Skokie Dist, sketches by W. R. McCornack, 10006 Carnegie Ave., Cleveland, O., 3 story, basement, concrete, brick stone high school, incl. 2 swimming pools. $1,500,000.

Ia., Waterloo—Bd. Educ., W. C. Logan, secy., 405 Pioneer Natl. Bank Bldg., plans by Ralston & Ralston, 218 Pioneer Natl. Bank Bldg., Lowell Grade School, 2 story, 103 x 238 ft., Washington St. at Williston Ave. $175,000.

La., Vivian—Caddo Parish School Bd., E. W. Jones, supt., plans by E. F. Nield, City Bank Bldg., Shreveport, 2 story, basement, concrete brick addition, incl. auditorium, gymnasium. $150,000.

Mass., Boston—McNeel Institute of Investment Education, Inc., 126 Newbury St., educational building. $200,000. Architect not selected.

Mass., Brookline (br. Boston)—Town, C. P. Rowley, chn. Bd. Selectmen, revised plans by M. P. Meade, 80 Boylston St., Boston, William H. Lincoln Grade School, 2 story, basement, brick, Walnut St. $450,000. J. P. Dwyer, 80 Boylston St., Boston, engr.

Mass., North Randolph—Town plans by J. E. Kelley, 38 Chauncy St., Boston, Mass., 10 room brick, steel grade school, O St., also 2 room addition, Holbrook Sect. $125,000-$150,000. Noted July 10.

Mich., Lincoln Park (br. Detroit)—Bd. Educ. plans by J. G. Kastler Co., 523 Detroit Savings Bank Bldg., Detroit, 2 or 3 story, basement, 175 x 345 ft., concrete, brick, steel, stone, incl. auditorium, gymnasium, swimming pool.

Minn., Windon—Bd. Educ. plans by George Pass & Son and P. T. Rockey, Mankato, 2 story, basement, rein.-con., brick, stone. $215,000.

N. J., Fairview—Bd. Educ., O. Küenzler, pres., Lincoln School, revised sketches by R. Cadien, 545 Gorge Rd., Cliffside Park, 2 story, basement, brick, steel, rein.-con. grade and junior high school, Bergen Blvd. $350,000. Noted June 19.

N. J., Elizabeth—Bd. Educ., 417 South Broad St., altering and constructing 2 story, basement, brick, steel addition to School 7, Grier Ave., $150,000; constructing 2 story school, Clarkson Ave., $250,000; Junior High School, $1,000,000; 2 story addition to Junior High School, Loomis St., $150,000. H. B. Brady, Inc., 333 North Broad St., probable archt.

N. J., Linden—Bd. Educ. sketches by H. B. Brady, Inc., 333 North Broad St., Elizabeth, 2 story, basement, brick, steel addition to Senior High School, St. George Ave. $380,000. Noted July 24.

N. C., Winston-Salem—Bd. Educ. plans by H. Maclin, Winston-Salem, and W. R. McCornack, assoc. archt., 10006 Carnegie Ave., Cleveland, 3 story, basement, brick, concrete, steel high school. $560,000.

O., Cleveland—Franciscan Sisters of Perpetual Adoration, J. A. McFadden, chancellor, Guarantee Title Bldg., plans by Warner & Mitchell, Bulkley Bldg., 4 story, basement, 40 x 200 ft., brick, stone, steel, concrete convent, East 40th St. and Euclid Ave. $250,000.

Tenn., Knoxville — University of Tennessee, H. A. Morgan, pres., plans by Barber & McMurray, Guarantee Bldg., 2 story, basement, rein.-con., brick, tile, stone gymnasium, 4,500 seating capacity. $250,000.

Tenn., Knoxville—Bd. Comrs. University of Tennessee, sketches auditorium, gymnasium, biology, infirmary and health center, also remodeling present buildings, on campus. $805,000 appropriated. S. Johnson, secy. Noted June 26.

Tenn., Nashville—State of Tennessee sketches by W. R. McCornack, 10006 Carnegie Ave., Cleveland, O., concrete, steel, stone industrial college. $1,000,000.

Tex., Donna—Bd. Educ. 2 or 3 story, rein.-con., brick high school. $200,000. Architect not selected.

Va., Petersburg—State of Virginia sketches by W. R. McCornack, 10006 Carnegie Ave., Cleveland, O., 3 story, basement, concrete, brick, steel industrial college. $1,000,000.

Ont., North Bay—City Council bids early in August, 2 story, basement, brick vocational school, Ferguson St. $285,000. S. B. Coon & Son, 4 St. Thomas St., Toronto, archts.

Ont., Toronto—Corp. University of Trinity College plans by Darling & Pearson, 2 Leader Lane, St. Hildas College buildings, St. George St., also completing buildings on Hoskin Ave. $2,000,000.

BIDS ASKED

Ill., Chicago—Aug. 5, by Bd. Educ., 188 West Randolph St., E. Withall, bus. mgr., Senn High School Addition, 5900 North Glenwood Ave. P. Gerhardt, c/o owner, archt.

Mass., Yarmouth—School Comm., H. Martin, chn. building comm., bids about Aug. 1, 2 story, basement, brick high and grade school, South Yarmouth Sect. $200,000. J. H. Ritchie & Associates, 250 Stuart St., Boston, archts. Noted June 5.

Mich., East Lansing — Aug. 8, by H. L. Stanton, vice pres. Detroit & Security Trust Co. Trustees, Fort St., Detroit, 3 story, basement, concrete, brick, steel, stone dormitory on campus, for Michigan State College. $425,000. Malcolmson & Higginbotham & Trout, 1217 Griswold St., Detroit, archts. Noted June 26.

Mich., Detroit—Aug. 6, by C. A. Gadd, bus. mgr. Bd. Educ., 1354 Bway. Ave., 2 story, basement, 12 room, brick, steel, rein.-con. school unit, separate power house, Bolleyn Ave. $200,000. A. H. Gould & Son, 602 Empire Bldg., archts.

Mich., Detroit—Aug. 6, by C. A. Gadd, bus. mgr. Bd. Educ., 1354 Bway. Ave., 2 story, basement, brick, steel, rein.-con., plain found., Grandville Ave. $175,000. Stratton & Hyde, 204 Marquette Bldg., archts.

Mich., Trenary—Aug. 9, by M. G. Kiser, secy. Bd. Educ., 3 story, basement, 45 x 100 ft., concrete, brick, steel, stone, plain found. $150,000. R. V. Gay, St. Johns, archt.

N. J., Bayonne—F. F. Durang, archt., 424 Madison Ave., New York, bids about Sept. 2, general contract 2 story, basement, 100 x 200 ft., brick, steel, rein.-con. high school, plain found., West 13th St., for St. Mary's Church, R. W. Lawlor, dir. Educ. of Newark Diocese, 326 Avenue C. $300,000. Noted May 1.

N. J., Plainfield—J. S. Piggott, archt., 42 Walnut St., Newark, bids about Sept. 2, general contract 2 story, basement, brick, steel, Liberty St., for St. Mary's Roman Catholic Church, P. A. Maher, pastor, 516 West 6th St., $300,000. Noted July 3.

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Schools (Continued)

N. J., Clifton—Bd. Educ., High School Bldg., bids about Sept. 2. School 3, 2 story, basement, brick, steel, Clifton Ave. $250,000. Lee & Hewitt, 152 Market St., Paterson, archts. Noted July 24.

N. J., Fort Lee—Bd. Educ., J. Whittaker, pres., High School Bldg., bids about Aug. 15. 2 story, basement, brick, steel, rein.-con. addition to School 4, plain found., Palisade Ave. $150,000. Hacker & Hacker, 201 Main St., archt. Noted July 3.

N. J., Lakewood—Bd. Educ., bids about Aug. 15. 2 story, basement, brick, steel, rein.-con., plain found. $150,000. C. B. Cook, Asbury Park Trust Bldg., Asbury Park, archt. Noted July 3.

N. J., New Vernon—Aug. 7, by Bd. Educ., Harding Twp., general contract 2 story, basement, brick, steel addition, plain found., New Vernon Rd. $150,000. C. Voorhies, Schuyler Pl., Morristown, archt.

N. J., Rutherford — Bd. Educ., High School Bldg., bids about Sept. 2, 2 story, basement, brick, steel, rein.-con. addition to Lincoln School, Montross Ave. $150,000. E. I. Williams, 131 West Passaic Ave., archts.

N. Y., Jasper—Aug. 6, by B. F. Smith, dist. clk., general contract school. Pamer Rogers, 1 Madison Ave., New York, archt.

O., Columbus—C. E. Steeb, secy. Bd. Trustees Ohio State University, bids about Sept. 1, 3 story, basement, 187 x 200 ft., brick, steel, concrete, stone teachers building on campus. $400,000. H. D. Smith, c/o owner, archt. Noted Aug. 29.

Okla., Oklahoma City — Aug. 11, by J. G. Stearley, clk. School Bd., W. H. Taft Junior High School, 3 story, basement, 88 x 190 ft., brick, Shartel St. $175,000. Layton, Hicks, Forsyth, Braniff Bldg., Oklahoma City, archts.

Pa., Cambridge Springs—Polish Natl. Alliance College, S. P. Mizwa, pres., Cambridge Springs, and 149 East 67th St., New York, taking bids two 3½ story, 83 x 162 ft., brick, terra cotta, granite, steel, rein.-con. dormitories, Fullerton Ave. between Ross and Thomas Sts. N. Kistrazanowski, 5057 Woodward Ave., Detroit, Mich., archt. Noted May 22.

CONTRACTS AWARDED

Calif., Napa—De La Salle Institute, Martinez, 3 fireproof buildings for boys school, to J. P. Brennan, 354 Hobart St., Oakland, $300,000. Noted June 19.

Calif., Westwood—Mount Saint Marys College, 3300 West Slauson Ave. (1st unit) 3 story, 91 x 276 ft., rein.-con., timber, stucco, marble dormitory, classroom, Blair St., to J. P. Brennan, Biltmore Hotel, Los Angeles, $230,000.

Ind., Evansville—Bd. School Comrs., general contract 60 x 100 ft., brick, steel, Knight Twp., to Jacob-Schmidt, 7 Denby Ave. Est. $150,000.

Ind., Hobart—Bd. School Comrs., general contract 2 story, basement, 60 x 100 ft., brick, steel, school, to R. J. King Constr. Co., Hobart. Est. $150,000. Noted July 19.

Ind., Indianapolis — Bd. School Comrs., Columbia City, general contract 60 x 105 ft., brick, steel, to Doty Bros., Milford; plumbing and heating, to H. W. Canvin, Huntington; electrical work, to Henry Electric Co., 1308 Bway., Ft. Wayne. Est. $150,000. Noted July 10.

Ind., Peru—St. Charles Catholic Church, general contract 2 story, basement, 125 x 125 ft., brick, steel school, West 5th St., to J. Burke, Peru. Est. $150,000. Noted June 12.

Mass., Boston—Boston Medical Library and Massachusetts Medical School, c/o J. W. Barthol, chn. com., 8 Fenway St., 3 story, basement, brick, steel, stone addition to library, plain found.,* Fenway St., to L. D. Willcutt & Sons Co., 146 Summer St. Est. $300,000. Noted Nov. 4.

Mass., Medford—City, A. Harty, chn. school building com., altering 3 story, basement, brick high school, Forest St., to Frankini Bros. Co., 30 Mystic Ave., $115,200.

Mass., Needham—Town, R. Cole, chn. building com., altering and constructing 2 story, basement, brick, stone addition to Palmer Grammar School, May St., to Archdeacon & Sullivan, 5 East Concord St., Boston. Est. $150,000. Noted July 10.

Mass., Provincetown—Town, F. J. Day, chn. building com., general and plumbing contracts Junior and Senior High School, 2 story, basement, 90 x 140 ft., brick, steel, limestone, concrete found., to F. A. Days & Sons, Pearl St.; heating and ventilating, to G. M. Montle, 900 Pleasant St., Fall River; electrical work, to Brady Electric Co., 236 Bedford St., Fall River. Noted June 12.

Mich., Benton Harbor — Bd. Educ., general contract Junior High School, 2 story, basement, concrete, brick, steel; plain found., to M. W. Stock Co., St. Joseph, $126,477.

Minn., Granite Falls—Bd. Educ., J. C. Woolstad, clk., general contract 2 story, basement, rein.-con., brick, stone, to J. Juul, Hutchinson and Litchfield. Est. $200,000. Noted July 10.

Mo., Clayton—Bd. Educ., c/o J. L. Bracken, supt., 7500 Maryland Ave., 2 story, basement, brick, steel, to Kellermann Contg. Co., Buder Bldg., St. Louis, $148,775. Noted July 10.

N. J., Elizabeth—School Bd., general contract School 21, 2 story, basement, steel, plain found., to F. J. Schmieder, 514 Elizabeth Ave., $185,000; plumbing, to Jaehnig & Peoples, Inc., 221 13th Ave., Newark, $11,725. Noted July 10.

N. J., Kearny (sta. Arlington) — Myers & Shanley, archts., 24 Walnut St., Newark, general contract 2 story, basement, brick, steel high school addition, to E. M. Waldron, Inc., 40 Park Pl., Newark, for St. Cecelia's Roman Catholic Church, J. Preston, pastor, 120 Kearny Ave. $150,000. Noted July 17. Plumbing and heating, to J. E. Joyce, 84 South 6th St., Newark; electrical work, to Davis Electric Co., 115 Central Ave., Newark.

N. Y., Bridgehampton — Bd. Educ., general contract school, to F. R. Duryea, Windmill Lane, Southampton. Est. $300,000. Noted June 5.

N. Y., Chatham—Fanning & Shaw, archts., 49 Ward St., Paterson, general contract 2 story, basement, brick, steel, plain found., to Bontempo & D'Annunzio, Inc., 39 Washington St., Morristown, for St. Patricks Roman Catholic Church, J. H. Donnelly, rector, 35 Oliver St. Est. $150,000. Noted July 10.

N. Y., Hempstead—School Dist. 27, c/o H. Siedenburg, Hempstead Gardens, 2 story school, to Wills-Egelhof, 303 West 42nd St., New York. Est. $355,000. Noted May 1.

O., Columbus—C. E. Steeb, secy. Bd. Trustees State University, irregular shaped, brick, concrete natatorium, 55 ft. high, on campus, to J. I. Barnes, Springfield, $421,400; heating and plumbing, to S. A. Esswein, West Broad St., $61,380. Noted June 26.

O., Columbus—C. E. Steeb, secy. Bd. Trustees Ohio State University, general contract for 2 and 4 story, basement, brick, concrete, stone physical education building, on campus, to Boyasohn & Barr, 299 South Front St. $412,690; heating and plumbing, to Huffman & Wolfe Co., 669 North High St. $49,024. Noted June 26.

O., Oberlin—Oberlin College, E. H. Wilkens, pres., 2 story, basement, steel, concrete chapel, dormitory, to Crowell & Little Constr. Co., 930 Hanna Bldg., Cleveland. Est. $500,000. Noted Apr. 24.

Pa., Rankin (br. Braddock)—Bd. Educ., E. Katz, pres., 314 5th Ave., 3 story, basement, 70 x 102 ft., brick, tile, also gymnasium, to E. Lawson, 7725 Cannon St., Swissvale. Est. $210,000. Noted July 3.

Ont., Windsor — Bd. Educ., general contract Harold E. Guppy School, 2 story, basement, concrete, brick, steel, to Wilson-Muxlow Ltd., Tuson Bldg., $267,222; plumbing and heating, to Drake, Avery Co. Ltd., Provincial Bank Bldg., $70,835. Noted May 29.

Que., Montreal—United Talmud Torah, 86 x 118 ft. school, St. Joseph Blvd., to I. Gilletz, 4392 City Hall Ave., $150,000.

THEATRES

PROPOSED WORK

Calif., Beverly Hills—Gore Bros. Inc., c/o Balch & Stanberry, Film Exch. Bldg., Los Angeles, sketches 2 story, 2,000 seating capacity, rein.-con. theatre. $300,000.

Calif., Los Angeles — Fox West Coast Theatres, Inc., Washington and Vermont Sts., plans by Balch & Stanberry, Film Exch. Bldg., 2 story, rein.-con., 2,000 seating capacity, Melrose Ave. $250,000.

La., Lafayette — Southern Amusement Co., c/o Jefferson Theatre, plans by H. J. Duncan, Alexandria, rein.-con., brick with mezzanine, balcony, main floor to seat 1,200 persons. This corrects report in June 26 issue.

BIDS ASKED

N. J., Hackensack—July 30, by T. W. Lamb, archt., 644 8th Ave., New York, general contract 2 story, basement, brick, steel, plain found., 220-22 Main St., for Warner Bros., Pictures, 321 West 44th St., New York. H. M. Warner, pres. Noted July 17.

N. J., Newark—J. Eberson, archt., 370 Lexington Ave., New York, bids about Sept. 2, general contract 1 story, basement, brick, steel, plain found., 878-80 Broad St., for Warner Bros. Pictures, Inc., 321 West 44th St., New York. $1,000,000. Noted July 3.

CONTRACTS AWARDED

Calif., Huntington Park — W. Mayock, 510 South Spring St., Los Angeles, 2 story, rein.-con., marble, 2,000 seating capacity, to O'Neal & Son, 3839 Wilshire Blvd., $300,000. Fox West Coast Theatres, Inc., Washington and Vermont Sts., Los Angeles, lessee. Noted June 26.

Calif., Oceanside — Bernard Nessa Estate 4 story, 100 x 220 ft. rein.-con. theatre, hotel, office building, to Pozzo Constr. Co., 421 Macy St., Los Angeles, $300,000.

O., Toledo—R. K. O. Theatres, 1564 Bway., New York, remodeling Palace and Rivoli Theatres, St. Clair St., to E. H. Voss, 612 Huron St. Est. $300,000. Noted July 3.

Tenn., Nashville—Paramount Theatres, Inc., 1375 Bway., New York, cream brick, steel, Church St. near 8th St., to Kaiser-Ducett Co., Joliett, Ill. Est. $200,000.

BANKS

PROPOSED WORK

Vt., Burlington—Chittendon Co. Trust Co., E. J. Booth, pres., 114 Church St., sketches by Harper & West, 92 State St., Boston, Mass., 2 story, basement, brick, concrete, marble, College St. $200,000.

BIDS ASKED

La., Shreveport — Commercial Natl. Bank, R. T. Moore, chn. bd., postponed taking bids indefinitely 10 story; basement addition, Market St. near Texas St. $500,000. Noted Apr. 3.

Mass., Brookline—Aug. 6, by Boulevard Trust Co., R. H. Porter, treas., and J. W. Beal Sons Co., archts., 185 Devonshire St., Boston, 1 story, basement, brick, steel, concrete, plain found., Coolidge Corner, Beacon and Harvard Sts. $150,000 or more. Noted July 17.

N. J., Passaic—Halsey, McCormick & Helmer, archts., 286 5th Ave., New York, bids about Aug. 15, 8 story, basement, brick, steel, incl. offices, Main St. and Howe Ave., for Peoples Bank & Trust Co., and Hobart Trust Co., 587 Main Ave. $350,000. Noted June 19.

N. J., South Orange—Aug. 4, by Myers & Shanley, archts., 24 Walnut St., Newark, general contract altering and constructing 2 story, basement, brick, steel addition, plain found., for South Orange Trust Co., 53 South Orange Ave. $150,000. Noted July 24.

N. J., Stone Harbor—I. H. Glaser, archt., 620 Madison Ave., New York, bids about Aug. 15, general contract 1 story, basement, brick, steel, plain found., for First National Bank, H. I. Taylor, pres. $200,000. Noted July 3.

CONTRACTS AWARDED

Mo., Kansas City—Fidelity Natl. & Trust Co., 10th St. and Grand Ave., 32 story, basement, brick, steel, to Thompson Starrett Co., 250 Park Ave., New York. Est. $3,000,000. Noted May 8.

N. H., Claremont — Claremont Natl. Bank, altering and constructing 2 story, basement, brick, steel, concrete addition plain found., to W. Fletcher, Brookside Ave. Est. $150,000. Noted July 10.

N. J., Ridgewood — West Side Bank, c/o D. J. Baum, archt., Spuyten Duyvil Parkway, New York, 2 story, basement, brick, steel, to Adams-Faber Co., 247 Loraine St., Montclair, $150,000.

OFFICES

PROPOSED WORK

Ga., Valdosta—R. E. Spaulding Co., R. E. Spaulding, pres., 7 story office. $200,000.

Okla., Enid—Amer. Natl. Bank, sketches by G. V. Blumenauer, Enid, 17 story, 14 x 75 ft., Randolph St. $1,000,000.

Pa., Pottsville—Comrs. Schuylkill Co., plans by Eric Fisher Wood & Co., Hardy & Hayes Bldg., Pittsburgh, 3 story, brick, steel, stone office. $400,000.

BIDS ASKED

N. J., Hackensack—Owner, c/o P. J. Jossier, archt., 240 Broad Ave., Palisades Park, bids about Aug. 15, general or separate contracts 2 story, basement, 60 x 120 ft., brick, steel, incl. stores, showroom, Main St. $150,000. Noted July 10.

N. Y., New York—See "Contracts Awarded."

O., Columbus—Aug. 25, by State Building Comn., C. D. Simral, secy., State House, 14 story, basement, 110 x 320 ft. and 70 x 317 ft., sandstone, steel, brick, on waterfront between State and Town Sts. $3,097,000. H. Hake, 2400 Gilbert Ave., Cincinnati, archt. Noted Aug. 29.

CONTRACTS AWARDED

Ia., Des Moines—See "Warehouses."

N. Y., New York—Financial District Realty Co., E. Cohen, pres., 206 Bway., 24 story, incl. bank, separate contracts. $700,000. Schwartz & Gross, 206 Bway., archts. Noted July 10.

Ore., Eugene — A. E. Doyle & Associates, archts., Pacific Bldg., Portland, general contract 12 story, basement, rein.-con. office, plain found., 8th and Willamette Sts., for Medical Arts Assn., to Hargrave & Linsay, Eugene, $155,796; structural steel, to Poole & McGonigle, 1650 Halsey St., Portland, $28,180. Wiring, to Morrison Electric Co., Eugene, $10,000; marble work, to Lutz & Co., Pittock Bldg., Portland, $17,967; elevators, to Otis Elevator Co., 72 North 10th St., Portland, $19,600.

R. I., Providence — Providence Community Fund, P. B. Simonds, c/o K. C. Richmond, archt., 10 Weybosset St., remodeling 5 story, basement, brick, plain found., 102 North Main St., to Central Eng. & Constr. Co., 210 Main St., Pawtucket. Est. $150,000. Noted July 10.

Tex., Dallas—I. J. Norris, c/o McNenk & McNenk, Athletic Club Bldg., general contract Tower Petroleum, 22 story, basement, rein.-con., brick, steel, stone, Elm and St. Paul Sts., to Henger & Chambers, Dallas Natl. Bank Bldg. Est. $1,500,000. Contractor taking bids on all sub-contracts.

STORES

PROPOSED WORK

Calif., Long Beach—Group of Business Men headed by R. and P. Bixby, and C. W. Bakay, sketches by Dedrick & Bobbe, 901 Heartwell Bldg., 1 and 2 story, basement, tower, 250 x 250 ft., rein.-con., U shaped, 5th St. and American Ave. To exceed $500,000.

Calif., Los Angeles—F. and W. Grand Silver, Inc., plans by Walker & Eisen, 1117 Western Pacific Bldg., 6 story, basement, 60 x 150 ft., rein.-con., steel, incl. loft, Bway. between 5th and 6th Sts. $250,000.

Pa., Charleroi—A. B. Lowstutter, archt., 311 5th Ave., soon lets contract 3 story, basement, 40 x 100 ft. furniture store, brick, steel, 310-12 5th Ave., for C. L. Melenyzer, 612 Fallowfield Ave. $150,000.

O., Cleveland — Cleveland Terminal Building Co., R. H. Sharpe, genl. mgr., Terminal Tower, plans by Graham, Anderson, Probst & White, archts. and engrs., Railway Exch. Bldg., Chicago, Ill., superstructure 12 story, basement, concrete, brick, steel department store, Prospect Ave. and Ontario St. $10,000,000. Higbee Co., Euclid Ave. and East 13th St., lessee.

Stores (Continued)

BIDS ASKED

N. J., Lyndhurst—P. J. Jossier, archt., 240 Broad Ave., Palisades Park, bids about Aug. 15, general or seperate contracts 2 story, basement, 90 x 100 ft., brick, steel, incl. apartments, plain found., for Owner, c/o architect. Noted July 24.

N. J., Newark—Myers & Shanley, archts., 24 Walnut St., bids about Aug. 15, general contract 1 story, basement, 60 x 190 ft., brick, steel, 657-59 Broad St., for W. W. Oppenheim, Inc., 657 Broad St. $150,000. F. W. Woolworth, 661 Broad St., Newark, lessee. Noted July 24.

CONTRACTS AWARDED

Ore., Portland—H. Brookman, archt., Yeon Bldg., 14 story, 2 basement, 200 x 200 ft. store, Alder, 5th and 6th Sts., to Dinwiddie Constr. Co., Crocker Bldg., San Francisco, Calif., and L. H. Hoffmann, Pub. Serv. Bldg., for Meier & Frank Co., 147 5th St. Total est. $2,000,000.

Wyo., Yellowstone Natl. Park—C. A. Hamilton, Old Faithful Inn, 2 story, 140 x 150 ft., to Rassmussen & Brown, Bozeman, Mont., $150,000.

PUBLIC

PROPOSED WORK

California — JAIL — City, plans by C. O. Brittain, supt. City Constr. Dpt., City Hall, and soon takes bids 5 story, basement, 45 x 120 ft., and 45 x 110 ft. wing, rein.-con., Lincoln Heights.

Mass., Everett—FIRE STATION—City, M. O'Neil, mayor, City Hall, brick, Hancock St. $150,000 or more. Engineer and architect not selected.

Mass., Sudbury—TOWN HALL—Town, H. N. Fairbanks, chn. building comm., receiving sketches, Main St. $150,000. Architect not selected.

Mass., Newton—POLICE STATION—City, S. Weeks, mayor, City Hall, police station. To exceed $150,000. Engineer and architect not selected.

N. J., Cliffside Park — MUNICIPAL and LIBRARY—Bd. Boro Council, Boro Hall, 2 story, basement, brick, steel, plain found. $150,000. Engineer and architect not selected.

Pa., Pittsburgh—POLICE and FIRE STATIONS—City, City County Bldg., plans by R. Neff, City County Bldg., 3 story, basement, 140 x 140 ft., 30 ft. set-back, brick, steel, limestone, Federal and Ohio Sts. $650,000.

Tex., Brownsville — ARMY POST — Fort Brown, c/o D. Van Voorhis, remodeling buildings. $300,000.

BIDS ASKED

Ala., Birmingham—ALMSHOUSES—Aug. 4, by Bd. Revenue Jefferson Co., and Turner & Van Arman, archts., Martin Bldg., fourteen 1 and 2 story, 50 x 50 ft. to 75 x 125 ft., brick almshouses, concrete foundations, at Ketona. $200,000.

Calif., Los Angeles—OFFICE—Aug. 5, by G. B. Dougall, Public Works Bldg., Sacramento, 12 story, 88 x 168 ft., rein.-con., granite, terra cotta, marble, tile, steel, 1st and Spring Sts., for State. To exceed $1,000,000. J. C. Austin & F. M. Ashley, 608 Chamber of Commerce Bldg., archts.

Mass., Waltham—FIRE STATION—Aug. 7, by City, c/o Mayor's Office, and C. G. Loring, archt., 7 Water St., Boston, 2 story, basement, rein.-con., brick, steel, concrete found., Lake and Church Sts., West End Sect. $150,000. Noted June 12.

N. J., Bayonne—LIBRARY—Bayonne Free Public Library, Avenue C, bids about Sept. 2, 2 story, basement, brick, steel, addition, Avenue C and 31st St. $150,000. C. Shilowitz, 26 Journal Sq., Jersey City, archt. Noted July 10.

N. J., Hillsdale—DORMITORIES—Aug. 5, by C. N. Leathem, State Bldg., Trenton, 4 dormitories, sewer and storm drains, barns and milk house, State Hospital, for Dpt. Institutions & Agencies, Trenton.

N. J., Trenton—STATE HOUSE—Aug. 8, by State House Comm., state house addition. $300,000. J. O. Hunt, archt. and H. A. Kelly, engr., both 219 East Hanover St. Noted July 24.

N. Y., Albany—CAPITOL—Spec. 6089—Aug. 7, by Superintendent P. Wks., State Office Bldg., repairing, altering capitol; adv. E. N.-R. July 31.

O., London—DORMITORY—Aug. 12, by A. T. Connar, supt. Dpt. P. Wks., 9th and Oak Sts., Columbus, 2 story, basement, 64 x 71 ft. and 71 x 614 ft., concrete, steel, at Prison Farm, here. $300,000. T. R. Ridley, Ohio-Hartman Bldg., Columbus, archts.

CONTRACTS AWARDED

N. J., Newark—POLICE STATION—Bd. City Comrs., City Hall, general contract 2 story, basement, brick, steel, to F. Briscoe Co., Inc., 287 South 19th St. Est. $150,000. Noted Feb. 27.

N. Y., New York — POLICE STATION — Police Dpt., 240 Center St., constructing 16th Precinct Station, to R. J. Murphy, 55 West 42nd St., $158,970.

O., Toledo—MUSEUM—Toledo Museum of Arts, Monroe St., steel addition, 251,000 sq.ft. floor space, Monroe St., to A. Bentley & Sons, Belmont St. Est. $2,000,000. Noted Dec. 19.

Pa., Uniontown—CHILDRENS HOME—Bd. Comrs. Greene Co., Court House, 2 story, basement, 47 x 131 ft. childrens home, Jefferson Twp., to J. Parecoco & Son, Box 141, Greensboro. Est. $150,000.

Wis., Waupun—WARD—State, Madison, general contract ward buildings, enclosing wall and boiler room addition, to W. M. Christensen, 1419 West 6th St., Racine, $104,000.

Que., Montreal—FIRE STATION—City, 42 x 80 ft. fire station, Somerled St., to J. A. Laceaire, 620 Cathcart St., $63,000.

BUILDINGS—UNCLASSIFIED

PROPOSED WORK

Calif., Long Beach—MAUSOLEUM—Sunnyside Mausoleum Co., c/o C. L. Jay, archt., 871 East Washington St., Pasadena, rein.-con. mausoleum, Cherry Rd. $150,000.

Calif., Los Angeles—MAUSOLEUM—T. W. Bishop, F. C. Huber, M. F. Jones, 622 Chapman Bldg., mausoleum, Riverside-Redondo Blvds. Est. exceeds $150,000. Architect not selected.

Ill., East St. Louis—DEPOT—Terminal R.R. Assn., 1800 Market St., St. Louis, Mo., H. J. Pfeifer, ch. engr., sketches 2 story, basement, 140 x 143 ft., rein.-con., brick, stone, steel depot, incl. elevated tracks, sewers, Main St. at Railroad Ave. $700,000. Private plans.

Md., Baltimore—REMOTE DELIVERY and GARAGE—Stewart & Co., Howard and Lexington Sts., revised plans by J. E. Sperry, Calvert Bldg., 2 story, basement, 168 x 202 ft., concrete, brick, steel, Josephine St. between Pine and Arch Sts. $200,000. H. F. Doeleman, Baltimore Trust Bldg., engrs.

Mass., Boston—STATION—City Transit Dpt., 1 Beacon St., rapid transit station, Charles and Cambridge Sts. $375,000. Private plans.

N. Y., New York — AUTO STORAGE and SERVICE STATION—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., plans by O. H. Merritt, 466 Lexington Ave., 10 story, 267 x 460 ft., 97 West End Ave. $1,500,000.

R. I., Woonsocket — HOME — Andrew F. Young Post of American Legion, H. Faubert, chn., 157 6th Ave., sketches by O. F. Drouin, Monument Sq., legion home, North Main St. $150,000.

BIDS ASKED

N. J., Gladstone—ORPHANAGE—DePace & Juster, archts., 151 West 46th St., New York, bids about Sept. 2, general contract 2 story, basement, brick, steel, plain found., for Villa O'Connor Orphanage, $150,000. Noted June 26.

N. J., Paterson — HOME — Lee & Hewitt, archts., 152 Market St., bids about Aug. 15, general contract 2 story, basement, brick, steel addition, Jackson St., for St. Francis Home, 25 Jackson St. $150,000. Noted July 24.

R. I., Providence—ASYLUM—Aug. 20, by St. Vincent de Paul Infant Asylum, W. A. Hickey, pastor, Fenner St., and A. J. Murphy, archt., 25 Fenner St., altering and constructing 3 story, basement, brick addition, plain found., Regent Ave. $150,000.

Va., Hollybrook—ORPHANAGE—Aug. 1, by Carneal, Johnston & Wright, archts., Electric Bldg., Richmond, St. Joseph Orphanage. $1,000,000.

CONTRACTS AWARDED

Calif., Los Angeles—PROPERTY—R. K. O. Studios, 780 North Gower St., 2 story, basement, 125 x 181 ft., rein.-con., steel, to Meyers Bros., 3407 San Fernando Rd., $107,000. Noted June 19.

Ill., Chicago—RESTAURANT and PAVILION—J. R. Thompson Co., 350 North Clark St., and Loebel, Schlossman & De Muth, archts., 612 North Michigan Ave., 4 story, basement, 60 x 180 ft. to Krahl Constr. Co., 350 North Clark St. Est. $500,000. Noted June 5.

N. Y., Buffalo—MARKET—New York Central R.R. Co., F. B. Freeman, New York, ch. engr., 70 x 300 ft. and 135 x 300 ft. buildings for (1st unit) Elk Street Market, for New York Central and Pennsylvania Railroads, to J. Johnson Constr. Co., 765 Abbott Rd., $500,000. Noted July 17.

Buildings

FACTORIES AND MILLS

PROPOSED WORK

Calif., Glendora — PACKING PLANT — Glendora Lemon Growers Assn. plans by W. W. Ache, 1616 4th Ave., Los Angeles, altering and constructing 2 story, basement, 90 x 163 ft., rein.-con. addition, 15,000 sq.ft. floor space. $45,000.

Conn., Bridgeport — FACTORY — Heppenstall Forge Co., 95 Howard Ave., soon lets contract brick factory unit. $40,000 or more. Fletcher-Thompson, Inc., 542 Fairfield Ave., archts.

Conn., Fairfield — FACTORY — McKesson & Robbins, soon let contract rein.-con., brick factory. To exceed $40,000. Fletcher-Thompson, Inc., 542 Fairfield Ave., Bridgeport, archts.

Conn., New Britain—FACTORY—Vulcan Iron Wks., John St., soon lets contract plans by M. J. Unkelbach, 52 Main St., 1 story, 70 x 175 ft. rein.-con., brick, steel, John St. $50,000.

Ind., South Bend—FACTORY—Roach-Appleton Electric Co., plans by Fett-Pearson & Goffeney, South Bend, 200 x 250 ft., rein.-con., brick, steel, at Belleville (suburb) $100,000.

Mass., Baldwinville—PAPER PLANT—Adams Paper Co. paper plant. $50,000. Private plans.

Mass., Cambridge—FACTORY—Aarat Grocery Co., Inc., Albany St., plans by J. Bilzerian, 339 Union St., Worcester, altering and constructing 2 story, timber addition. $40,000.

Mass., Cambridge—FACTORY—F. W. Webster Co., 240 Congress St., Boston, revised plans by Densmore LeClear & Robbins, 31 St. James Ave., Boston, 4 story, basement, 100 x 210 ft., rein.-con., brick, Hayward and Wadsworth Sts. $250,000. Noted May 22.

Mass., Everett—PLANT—New England Fuel & Transportation Co., 250 Stuart St., Boston, benzol plant, Rover St. $40,000 or more. Private plans.

Mass., Malden — ICE CREAM FACTORY — Malden Ice Cream Co., 84 Exchange St., sketches by A. W. K. Billings, Jr., 80 Boylston St., Boston, altering and constructing 1 story, basement, brick, concrete addition, concrete found., Exchange St. $40,000 incl. equipment.

Mich., Detroit — ALUMINUM PARTS FACTORY — Bohn Aluminum & Brass Co., Jos. Campau Ave., plans by C. W. Brandt, 1109 Francis Palms Bldg., 1 story, 40 x 300 ft., brick, concrete, steel, plain found., Jos Campau Ave. $50,000. Noted Mar. 6.

N. J., Jersey City—PAINT PLANT—Lowe Bros., 335 Grand St., rebuilding 2 story, basement, brick, steel, Grand St. and Jersey Ave. $50,000. Engineer and architect not selected.

N. J., Newark — AUTO LAUNDRY PLANT and SERVICE STATION — Elm Auto Supply Co., 267 Halsey St., plans by Adolph Goldberg, 164 Montague St., Brooklyn, 1 and 2 story, brick, steel, plain found., William St. between Halsey and Washington Sts. $40,000.

N. J., Rahway — FACTORY — Drumchrome Corp., c/o W. L. Finne, archt., 1201 East Grand St., Elizabeth, 1 and 2 story, basement factory. $40,000.

O., Cleveland—ROLLING MILL—Otis Steel Co., E. J. Kulas, pres., 3341 Jennings Rd., sketches 1 story, concrete addition, concrete found. $5,000,000. Private plans.

Pa., Butler—PLANT—Amer. Austin Car Co., Butler, sketches body plant. $750,000.

Pa., Phila.—FACTORY—July 28, by E. A. Stopper, archt., 10 South 18th St., 1 and 2 story, basement, 50 x 240 ft., furnace factory, 3335-59 Stockley St., for C. Kahn, Provident Trust Bldg., Ryan Scully & Co., Wissahickon Ave. and Yelland St., lessee.

Tex., Harlingen—FACTORY—City, c/o S. Bates, mayor, soon lets contract 2 story, brick, rein.-con. $100,000. Private plans.

Va., Winchester—VINEGAR PLANT—H. J. Heinz Co., N. S. Pittsburgh, Pa., plans by R. M. Trimble, Commonwealth Building Annex, Pittsburgh, Pa., one 95 x 270 ft., one 52 x 139 ft., and one 45 x 133 ft. brick, steel, to G. F. Hazeltwood, Cumberland, Md. Est. $85,000.

Wis., Milwaukee—STEEL ADMINISTRATION—Inland Steel Co., 221 Wisconsin St., plans 2 story, 40 x 70 ft., brick, steel, administration building, 43rd St. $100,000. Private plans.

Ont., Kitchener—PLANT—Kiss Beverage Co., C. P. Mason, owner, 3 story plant. $100,000.

Ont., Niagara Falls—PLANT—Scott Pump Co., 645 Atlantic Ave., Rochester, N. Y., plant.

Ont., Windsor—FACTORY—Canadian Lamp & Stamping Co., concrete, brick. $150,000.

BIDS ASKED

Calif., San Jose—MEAT PACKING PLANT, etc.—Continental Packing Co., 1217 Park Ave., taking bids 1 and 2 story, rein.-con. packing plant, 1 and 2 story, timber, galvanized iron reduction plant, Berryessa Rd. $50,000.

N. J., Bound Brook — FACTORY — F. Y. Joannes, archt., 420 Lexington Ave., New York, taking bids 4 story, basement, 40 x 105 ft., brick, steel chemical laboratory and office addition, for Calco Chemical Co., Bound Brook Rd. $40,000. Noted June 27.

N. J., Carteret—PAINT FACTORY—Poggi & Bragdon, archts., 275 Morris Ave., Elizabeth, taking bids altering and constructing 2 story, basement, brick, steel addition, for Benj. Moore & Co. $40,000.

N. J., Harrison—FACTORY—Driver-Harris Co., Middlesex St., or J. A. Finegan, archt., 776 Broad St., Newark, bids about Sept. 2, general contract 1 and 2 story, basement addition. $250,000. Noted July 24.

N. J., Jersey City — FACTORY — B. Singer, archt., 921 Bergen Ave. bids about Aug. 15, general contract 2 story, basement, 45 x 140 ft., brick, steel, plain found., foot Crawford St., for Jersey City Ladder Co., Inc., 177 Montgomery St. $40,000. Noted July 17.

N. J., Roselle Park—FACTORY—Poggi & Bragdon, archts., 275 Morris Ave., Elizabeth, taking bids general contract 2 story, basement, brick, steel, concrete, plain found., Franklin Pl., for Fusco Bros., c/o architects. $40,000. Noted July 10.

N. J., Union City — DAIRY PLANT — G. Willaredt, archt., 411 23rd St., West New York, bids about Aug. 1, general contract altering and constructing 2 story, basement, 28 x 155 ft., brick, steel addition, New York Ave. and 45th St., for Consumers Dairy Co., 400 45th St. $45,000. Noted July 24.

N. Y., Buffalo—INDUSTRIAL—Aug. 4, by A. Kahn, archt., Marquette Bldg., Detroit, Mich., 2 story, 60 x 90 ft., 60 x 113 ft., 325 x 1,000 ft. machine shop, combination boiler house and power plant and assembly plant, Hamburg Turnpike, for Ford Motor Co., 3674 Schaefer Rd., Dearborn, Mich. Noted July 3.

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Factories and Mills (Continued)

O., Cleveland—FACTORY—Cleveland Trencher Co., A. V. Jones, genl. mgr., 20100 St. Clair Ave., taking bids and opens same about July 28. 1 story, 60 x 90 ft., brick, steel addition. $40,000. P. Schmidt, 4500 Euclid Ave., archt.

O., Willoughby—FACTORY—Ohio Rubber Co. taking bids 1 story, 140 x 400 ft., brick, steel, Ben Hur Ave. $150,000. Private plans.

Pa., Ambridge—ICE PLANT—Briola Bros., 10th St., taking bids 1 story, tile, 10th and Glenwood Sts., $60,000.

Ont., Toronto—SIGN PLANT—Aug. 2, by N. A. Armstrong & Co., archts., 7 King St. E., 2 story, basement, 90 x 200 ft., concrete, mill, brick, stone, for Flexume Sign Co. Ltd., 1068 Queen St. E., $100,000.

CONTRACTS AWARDED

Calif., Live Oak—PACKING and PROCESSING PLANTS—Walnut Growers Assn., 1 story, basement, concrete, to J. J. Cavanagh, Stockton, $23,060 exclusive of equipment.

Fla., Lake Wales—PACKING HOUSE—Tower Packing Co., J. W. Keen, pres., 92 x 120 ft., to Gifford & Simmons, Frostproof. Est. $35,000-$40,000.

Ill., Chicago—FACTORY—Hess Warming & Ventilating Co., 1207 South Western Ave., masonry contract 2 story, 120 x 125 ft., brick, to C. B. Johnson & Son, 306 South Wabash Ave. Est. $100,000. Noted July 17.

Ind., Indianapolis—FACTORY—M. Finn, general contract 2 story, 50 x 100 ft., brick, steel, Missouri and Empire Sts., to Humann & Helman, 520 North Hawthorne St. Est. $40,000.

Ind., Indianapolis—SUPER SERVICE STATION, etc.—Mid-Western Co., general ontract, super-service station, 22nd and Meridian Sts., to North Amer. Co., 403 Lumber Ins. Co., est. $40,000; service and machine shop, Washington St. and Emerson Ave., to R. Fatout, 625 Bd. Trade, est. $40,000, both brick, steel.

Ind., Kokomo—FACTORY—Haynes Stellite Co., general contract rein.-con., brick, to C. L. Sanders & Son, Portland. Est. $50,000.

Ind., Peru—FACTORY—Caruso Co., general contract rein.-con., brick, steel, 287 Bway., to C. J. Wolf, Loganport, Est. $41,000.

Mass., Boston—PLANT—Globe Newspaper Co., 242 Washington St., 5 story, basement, brick, incl. excav. for sub-basement, 53 Devonshire St., to W. H. Prebble Co., 11 Pemberton Sq. Est. $50,000.

Mass., North Billerica—MILL—C. T. Main, Inc., engrs., 201 Devonshire St., Boston, 1 story, 70 x 200 ft., brick, steel finishing mill, plain found., to H. Wales-Lines Co., 134 State St., Meriden, Conn., for Talbot Mills, F. S. Clark, pres. Est. $100,000. Noted July 10.

N. J., Teaneck (br. Hackensack)—DISTRIBUTION PLANT—Sheffield Farms Co., Inc., 524 West 57th St., New York, general contract altering and constructing 1 story, basement, 100 x 150 ft., brick, steel addition, to A. J. Robinson Co., 15 West 38th St., New York. Est. $75,000. Noted July 10.

N. J. ,Trenton—FACTORY—Delaval Steam Turbine Co., North Clinton Ave. and Pennsylvania R.R., 1 story, basement, brick, steel, to J. W. Ferguson Co., 152 Market St., Paterson, $40,000.

N. Y., New York—FACTORY—Starrett Investing Corp., 101 Park Ave., 18 story, 11th to 13th Aves., 26th and 27th Sts., to Starrett Bros. & Eken, Inc., 101 Park Ave. Est. $4,000,000.

N. C., Charlotte — LAUNDRY — Domestic Laundry, Inc., 805 South McDowell St., 50 x 100 ft., brick, concrete, to Southeastern Constr. Co., 210 West 2nd St., $50,000.

O., Cleveland—FACTORY—W. S. Tyler Co., E. P. Disbro, vice pres., 3613 Superior Ave., 3 story, basement, 70 x 106 ft., rein.-con., brick, East 36th St. and Superior Ave., to Aronberg-Fried Co., Terminal Tower. Est. $100,000.

O., Cleveland—GALVANIZING PLANT—Westinghous Electric & Mfg. Co., W. H. Freiner, constr. mgr., West 54th St., 1 story, brick, steel, West 54th St., to A. A. Lane Constr. Co., 1873 East 55th St. Est. $40,000.

R. I., Auburn—MANUFACTURING PLANT—Universal Winding Co., 3 story, 60 x 120 ft., brick, to Bowerman Bros., 70 Bath St., Providence. Est. exceeds $40,000.

Tex., Harlingen—BAKERY—Valley Bakery Co., 1 story, 120 x 212 ft., brick, tile, terra cotta, to Fogel Constr. Co., 619 Reliance Bldg., Kansas City, Mo., $125,000.

Tex., Houston — LAUNDRY — Shephard Laundries Co., 725 Washington Ave., 150 x 200 ft. to Knuson Constr. Co., Union Natl. Bank Bldg., $45,475.

Tex., Rio Hondo—ICE PLANT—Rio Hondo Ice Co., c/o G. H. Fisher, Stonewall Jackson Hotel, San Benito, 1 story, 25 ton, brick, rein.-con. plant. Owner builds. Private plans.

Ont., London—PLANT—Canadian Richards Wilcox Co., 1 story, 80 x 80 ft., tile addition, to McEachren Constr. Co., London. Noted June 12.

Ont., Waterloo—FACTORY—Waterloo Mfg. Co., 1 story, 100 x 250 ft., concrete, steel, to John V. Gray Constr. Co., 1602 Northern Ontario Bldg., Toronto; steel, to Dominion Bridge Co., Reford Bldg., Toronto; steel deck roofing, to Truscon Steel Co., Toronto. Est. $100,000.

Que., Montreal—FACTORY—Robertson Lead Co., 80 x 260 ft., Lafontaine St., to W. H. Madigan, 2165 Clifton St., $45,000.

GARAGES

BIDS ASKED

N. J., Hawthorne — J. C. Van Vlandren, archt., 140 Market St., Paterson, bids about Sept. 2, general or separate contracts 2 story, 90 x 140 ft., brick, rein.-con., Pasadena and Nelson Aves., for S. Braen, 115 Totowa Ave., Paterson. $150,000. Noted July 3.

N. J., Montclair—A. E. Ramhurst, archt., 516 Bloomfield Ave., bids about Aug. 1, general contract 2 story, basement, 100 x 165 ft., brick, steel, incl. salesroom, plain found., Glenridge and Grove Sts., for Lloyd White, c/o architect. $150,000. Noted July 3.

N. J., Plainfield—W. E. Lehman, archt., 972 Broad St., Newark, taking bids on separate contracts 1 and 2 story, basement, 100 x 135 ft., brick, steel, rein.-con. garage and office, for Aetna Realty Co., 872 Broad St., Newark. $150,000. Noted July 17.

N. Y., Batavia—Aug. 21, by Superintendent Div. Standards & Purchase, Executive Dpt., Capitol, Albany, garage at New York State School for Blind; adv. E. N.-R. July 31.

Pa., Pittsburgh—S. Danovitz (Cooperage), 3068 Center Ave., taking bids sub-contracts 1 story, part basement, 50 x 150 ft., brick, steel, 750 Shore St. $40,000. J. F. McWilliams, Negley Bldg., archt.

CONTRACTS AWARDED

Ind., Ft. Wayne—Red Fox Co., general contract brick, steel super-service station, State and Wells Sts., to M. Kinder & Sons, 3714 South Hanna St. Est. $41,000.

Mass., Brighton (br. Boston) — Commonwealth Garage, 100 Brighton Ave., remodeling 1 story, rein.-con., brick, steel service station, repair shop, plain found., Brighton Ave., to W. H. Porter, 133 Spruce St., Watertown. Est. $40,000.

Mass., Brockton — Eastern Massachusetts Street Ry. Co., 38 Chauncy St., Boston, converting 1 story, brick car barn into bus garage, Torrey and Main Sts., to Powers Bros., 161 Montello St. Est. $50,000. Noted July 17.

Ore., Eugene—C. W. Jackson, archt., Portland, 2 story, basement, 200 x 200 ft., concrete garage, stage center, store, hotel, plain found., to Stein Bros., Eugene, for Motour Hotel System, H. R. Malott, mgr., 754 Schuyler St., Portland. $125,000.

SHOPS AND FOUNDRIES

PROPOSED WORK

Mass., Springfield—SHOP—City Street Dpt., City Hall, plans by McClintock & Craig, 458 Bridge St., brick, steel repair shop and storage unit, Taylor St. $40,000.

Mo., St. Louis—PAINT SHOP—Amer. Car & Fdry. Co., 2800 DeKalb St., St. Louis, and 30 Church St., New York, 1 and 2 story, rein.-con., steel, brick addition, Dorcas St. near Main St. Private plans.

Pa., Oil City—SHOPS—Pennsylvania R.R. Co., Broad St. Sta., Phila., T. J. Skillman, ch. engr., improving shops, incl. additions to engine house, new machine shop, turn tables, ash pits, re-arranging power plant, storeroom, employees lunchroom, locker rooms. $300,000.

Ont., London — MACHINE and PATTERN SHOPS—E. Leonard & Sons, E. I. Leonard, genl. mgr., rebuilding 2 story, 100 x 150 ft. machine and pattern shops, York St., destroyed by fire. $100,000 loss. Private plans.

BIDS ASKED

Pa., Pittsburgh—MACHINE SHOP, etc.—Aug. 8, by E. B. Lee, archt., Chamber of Commerce Bldg., general contract 45 x 128 ft. machine shop, 27 x 60 ft. bath house, 50 x 80 ft. office building, all 1 story, brick, steel, at eastern end Neville Island, for Gulf Refining Co., Frick Building Annex, Pittsburgh, and 21 State St., New York. $1,500,000.

CONTRACTS AWARDED

D. C., Wash. — SHOP, GARAGE — District Comrs., District Bldg., remodeling building for highway shops, extending automobile repair shops, to A. L. Smith Co., 2525 Pennsylvania Ave. N. W., $211,200. Noted May 22.

Ind., Ft. Wayne—SHOP—Hoffman Bros., 1912 Howell St., brick, steel machine shop, service station, Main St. and Bway. $40,000. Owner builds. Private plans.

O., Cleveland — FOUNDRY — Republic Brass Co., 1623 East 45th St., 1 and 2 story, 25 x 136 ft., brick, steel addition, 1623 East 45th St., to A. A. Lane Constr. Co., 1873 East 55th St. Est. $40,000.

POWER PLANTS

PROPOSED WORK

Calif., Pasadena—City plans by Bennett & Haskell, 311 1st Trust Bldg. Class "A" light plant, Glenarm St. between Fairoaks St. and Raymond Ave. $150,000.

Conn., Terryville—Johnson Bros. dam, power house, incl. turbine generator, 180 ft. fall, to supply power for Greystone Sect., also Fall Mountain and Bucks Hill. To exceed $25,000. Private plans.

Conn., West Hartford—Hartford Electric Light Co., 266 Pearl St., Hartford, plans by W. T. Marchant, 36 Pearl St., Hartford, brick, steel, concrete power sub-station, Park and Swift Sts. $40,000 or more.

Ia., Toledo—Iowa Railway & Light Corp., Cedar Rapids, brick, concrete power plant, equipment, incl. Diesel engine driven generators, transmission lines.

N. Y., New York—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., plans by O. H. Merritt, 466 Lexington Ave., 3 story, 43 x 118 ft. sub-station, 12th Ave. and 135th St. $80,000.

Texas — Central Power & Light Co., c/o National Bank of Commerce Bldg., San Antonio, sketches hydro-electric plant, on Nueces River, at Lake Lovenskiold. $750,000. Private plans.

Tex., Galveston—Galveston Electric Co., 21st St. and Avenue L, improving power plant, incl. underground wires, installing synchronous condenser system, at 26th St. and Avenue E. $90,000. Private plans.

Tex., Mercedes—See "Excavation, Drainage, Irrigation, Levees, River and Harbor."

Vt., Charleston (mail Derby Line)—Village of Barton, c/o A. Cutting, altering and constructing 1 story, brick municipal light and power plant addition. $40,000. I. W. Jones & Co., Milton, N. H., engrs.

BIDS ASKED

Mass., Taunton—City, c/o Municipal Light Comn., taking bids 1 story, brick electric sub-station, incl. underground duct lines. $50,000. Jackson & Moreland, Park Sq. Bldg., Boston, engrs.

Mich., Detroit—See "Schools."

S. D., Pierre—Aug. 8, by City, c/o Auditor, 2 Diesel oil engines, each 4 cycle, air injection of 600 or 750 hp. capacity; 2 electric generators; and power plant addition. $125,000. R. Baker, city engr.

CONTRACTS AWARDED

Conn., Hamden (br. New Haven—Connecticut Co., 185 Church St., New Haven, 1 story, 25 x 40 ft., brick, steel, concrete power sub-station, to Natl. Constr. Co., 152 Temple St., New Haven. Est. $40,000 or more. Noted June 19.

Mass., North Andover — Meadow Brook Laundry, 1 story, 50 x 50 ft., brick, steel, concrete power plant, equipment, $25,000.. Owner builds. H. Petzold, 712 Bay State Bldg., Lawrence, engr. Noted July 24.

N. H., Dover — Twin State Gas & Electric Co., State St., Boston, Mass., brick, steel, concrete power transformer station. $40,000 or more. Owner builds. F. W. Mason, Green St., Augusta, Me., archt.

N. Y., New York—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., remote control sub-station, to Aronberg-Fried Constr. Co., Inc., 21 East 40th St. Est. $100,000.

Pa., Arden — Bd. Comrs. Washington Co. Home, boiler house, changing high pressure boilers to two tubular steam boilers, 11,150 ft. each, returning system of piping in old building, repairing piping system, pumps, to Spencer Sprowls, 765 Fayette St., Washington, $4,430; heating, to McVehil Plumbing & Heating Co., 40 East Wheeling St., Washington, $23,200.

Wash., Seattle—City, excavation for new city light power house at Diablo on Skagit River, also surge tank and power tunnel, to Rumsey & Jordan, Lumber Exch. Bldg., cost plus basis and $64,000 respectively.

WAREHOUSES

BIDS ASKED

Md., Baltimore—Aug. 4, by J. E. Sperry, archt., Calvert Bldg., 1 story, basement, 168 x 202 ft., rein.-con., brick, incl. garage, Josephine St. near Pine St., for Stewart & Co., Lexington and Howard Sts.

Wash., Seattle—Eyres Transfer & Warehouse Co., bids about Aug. 11, 3 story, basement, 102 x 148 ft. fireproof storage building, 2253 1st Ave. S. $175,000.

CONTRACTS AWARDED

Calif., San Pedro—Los Angeles Compress & Warehouse Co., Cotton Exch. Bldg., Los Angeles, 1 story, 150 x 750 ft., rein.-con., steel addition, Los Angeles Outer Harbor, to W. P. Neil Co., 4814 Loma Vista Ave., Los Angeles, $166,000.

Ia., Des Moines—Grocers Wholesale Co., 9th and Cherry Sts., 3 story, basement, 2 lower floors 107 x 300 ft., upper floor 107 x 122 ft., concrete, brick, steel, incl. office, 9th and Cherry Sts., to A. H. Neumann & Co., 519 Hubbell Bldg. Est. $300,000.

Minn., Fairmont—Fairmont Railways Motors, Inc., H. E. Wade, pres., general contract 1 story, brick, steel, concrete warehouse, to Splady & Haagenson, 711 Pence Bldg., Minneapolis. Est. $150,000. Noted June 19.

Pa., Phila.—Pennsylvania Warehousing Co., 113 South 13th St., 7 story, basement, 95 x 125 ft., rein.-con., brick, steel, plain found., Delaware Ave. and Lombard St., to Turner Constr. Co., 1700 Walnut St. Est. $200,000.

Que., Montreal — Canadian Natl. R.R., St. James St., 92 x 180 ft., Grey Nuns St., to Atlas Constr. Co., 679 Belmont St., $250,000.

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